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Chicago, September 27, 1930 | Issued Every Other Week | Volume XXXIII, No. 20

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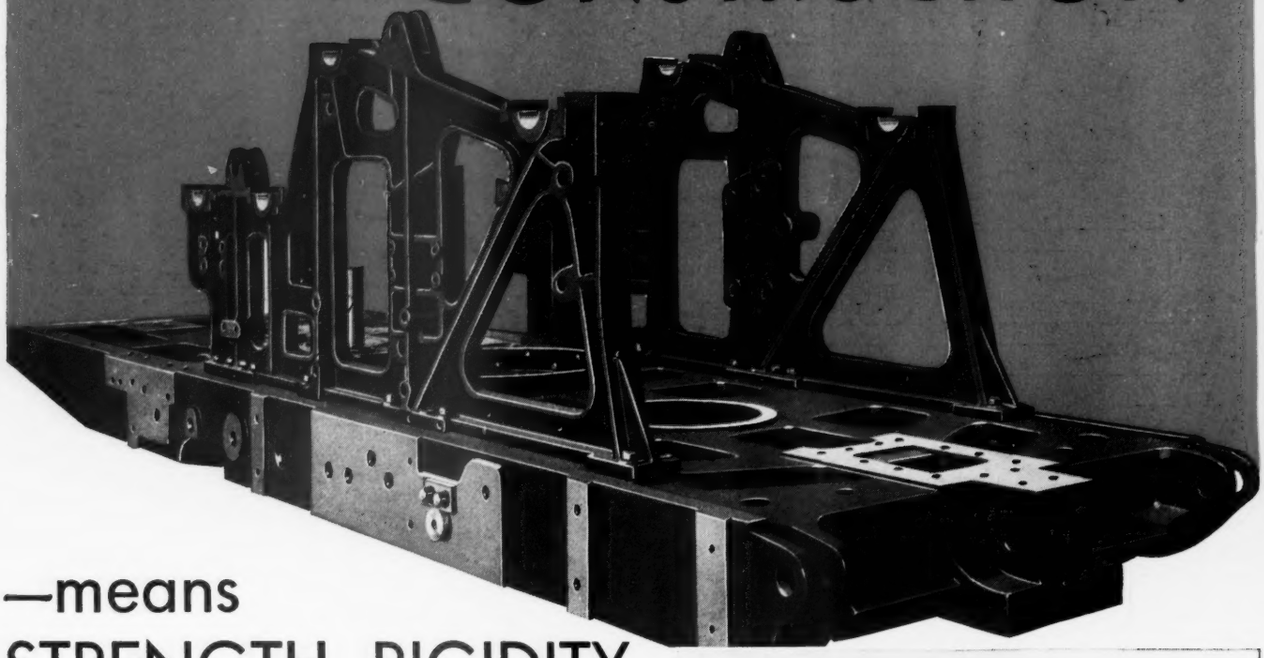

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EDMUND SHAW, Los Angeles, Calif., *Contributing Editor*
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Volume XXXIII | Chicago, September 27, 1930 | Number 20

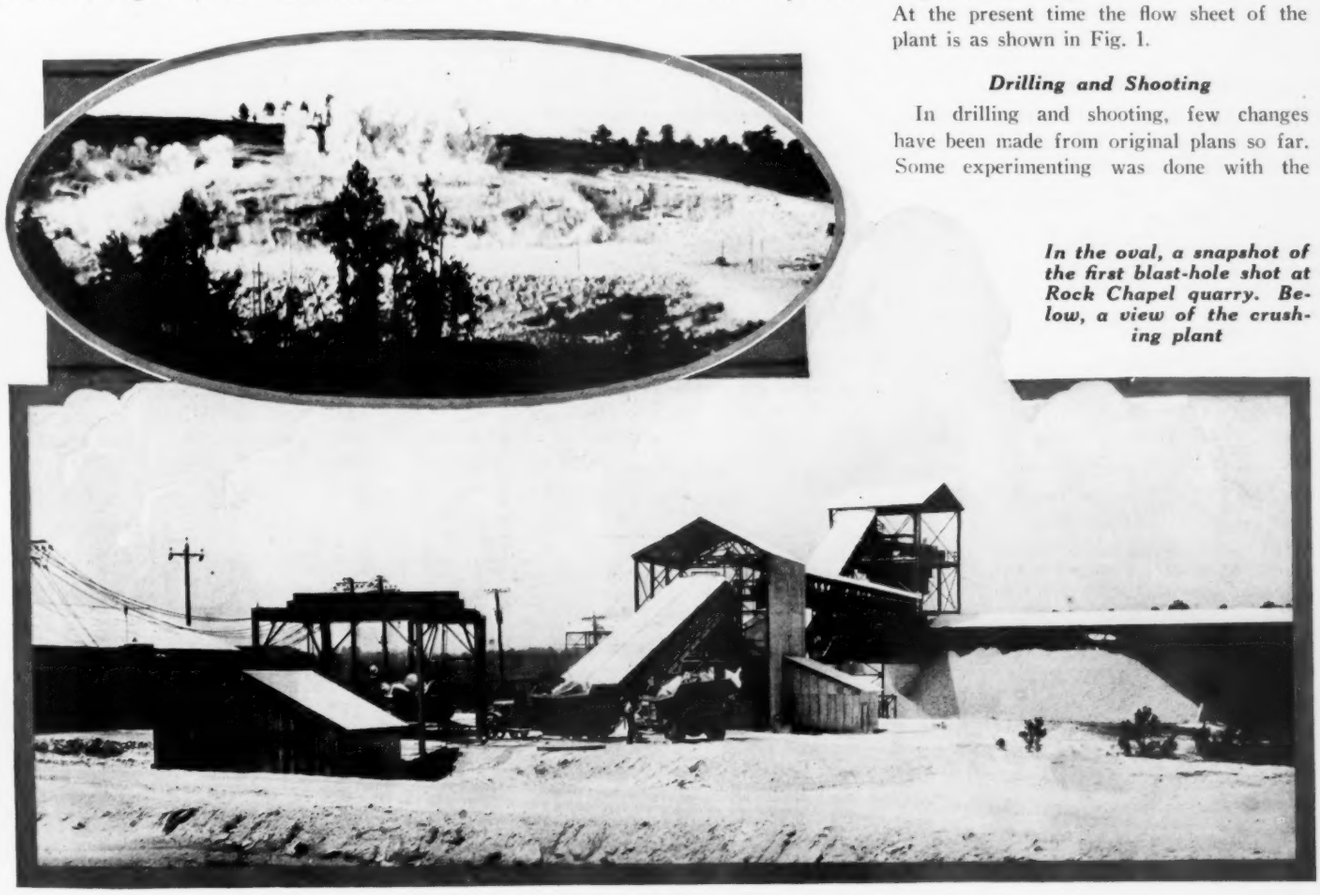
A Year's Operating Experience With A New Crushing Plant

Some Changes Made and Some Changes I Would Make in Building a New One

By Nelson Severinghaus
Superintendent, Consolidated Quarries Corp., Lithonia, Ga.

THE ROCK CHAPEL granite crushing plant of Consolidated Quarries Corp., near Lithonia, Ga., was put into operation April 1, 1929. The machinery and construction of the plant were described in ROCK PRODUCTS, August 3, 1929. Data for this article were obtained just as the plant was starting and they contained few operating facts. The plant was described as outstanding in design and construction among the plants built in 1929.

It has occurred to me that other operators would be interested in knowing how this plant has stood the test of the first year's operations, what changes were necessary in getting up to capacity and what changes, although not warranted now, would be incorporated if the plant were to be rebuilt. At the present time the flow sheet of the plant is as shown in Fig. 1.



In the oval, a snapshot of the first blast-hole shot at Rock Chapel quarry. Below, a view of the crushing plant

Drilling and Shooting

In drilling and shooting, few changes have been made from original plans so far. Some experimenting was done with the

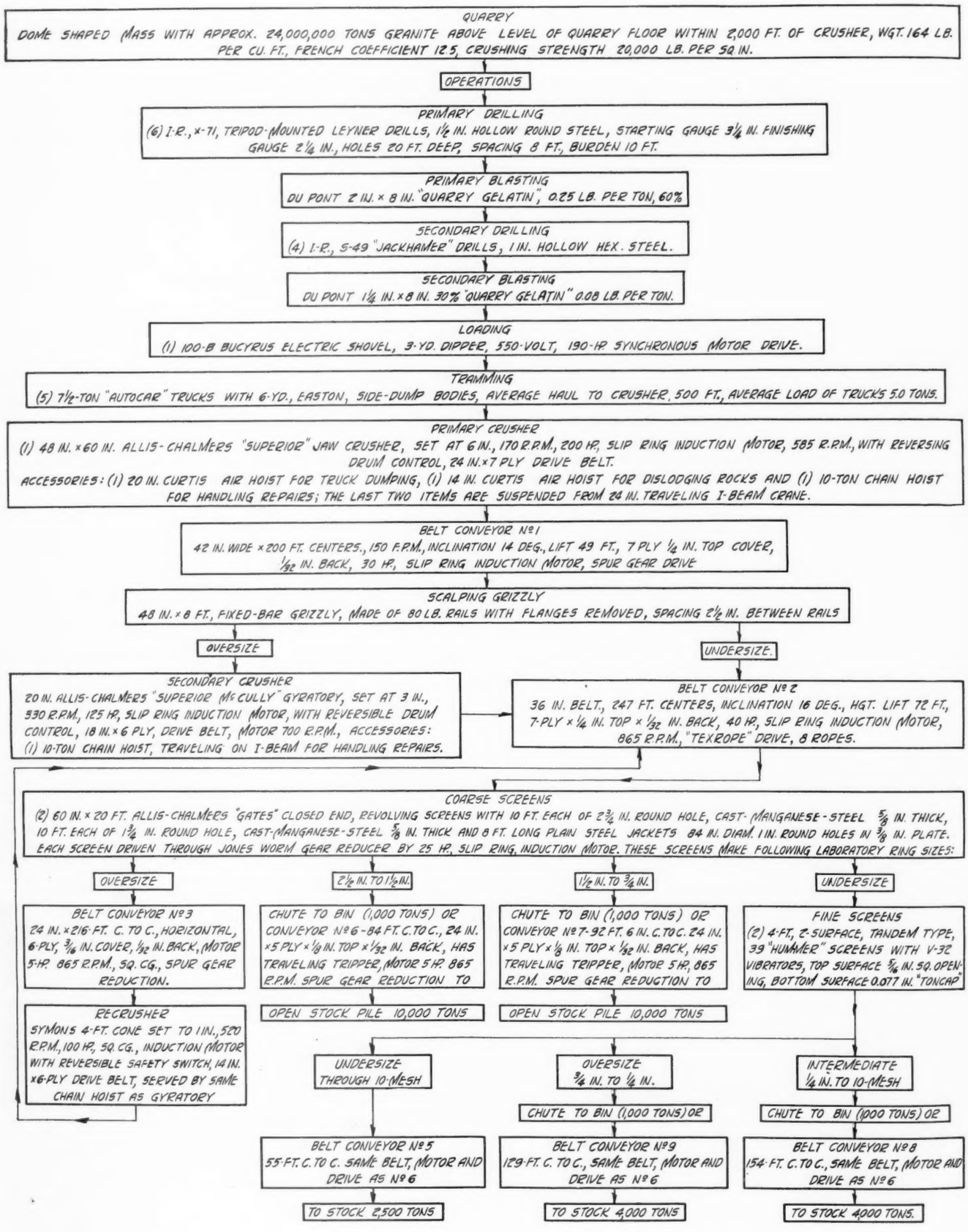

QUARRY
DOME SHAPED MASS WITH APPROX. 24,000,000 TONS GRANITE ABOVE LEVEL OF QUARRY FLOOR WITHIN 2,000 FT. OF CRUSHER, WGT. 164 LB. PER CU. FT., FRENCH COEFFICIENT 12.5, CRUSHING STRENGTH 20,000 LB. PER SQ IN.
OPERATIONS
PRIMARY DRILLING
(6) I-R., X-71, TRIPOD-MOUNTED LEYNER DRILLS, 1½ IN. HOLLOW ROUND STEEL, STARTING GAUGE 3¼ IN. FINISHING GAUGE 2¼ IN., HOLES 20 FT. DEEP, SPACING 8 FT., BURDEN 10 FT.
PRIMARY BLASTING
DU PONT 2 IN. × 8 IN. "QUARRY GELATIN", 0.25 LB. PER TON, 60%
SECONDARY DRILLING
(4) I-R., S-49 "JACKHAMER" DRILLS, 1 IN. HOLLOW HEX. STEEL.
SECONDARY BLASTING
DU PONT 1¼ IN. × 8 IN. 30% "QUARRY GELATIN" 0.08 LB. PER TON.
LOADING
(1) 100-B BUCYRUS ELECTRIC SHOVEL, 3-YD. DIPPER, 550-VOLT, 190-HP. SYNCHRONOUS MOTOR DRIVE.
TRAMMING
(5) 7½-TON "AUTOCAR" TRUCKS WITH 6-YD., EASTON, SIDE-DUMP BODIES, AVERAGE HAUL TO CRUSHER 500 FT., AVERAGE LOAD OF TRUCKS 5.0 TONS.
PRIMARY CRUSHER
(1) 48 IN. × 60 IN. ALLIS-CHALMERS "SUPERIOR" JAW CRUSHER, SET AT 6 IN., 170 R.P.M., 200 HP, SLIP RING INDUCTION MOTOR, 585 R.P.M., WITH REVERSING DRUM CONTROL, 24 IN. × 7 PLY DRIVE BELT.
ACCESSORIES: (1) 20 IN. CURTIS AIR HOIST FOR TRUCK DUMPING, (1) 14 IN. CURTIS AIR HOIST FOR DISLODGING ROCKS AND (1) 10-TON CHAIN HOIST FOR HANDLING REPAIRS; THE LAST TWO ITEMS ARE SUSPENDED FROM 24 IN. TRAVELING I-BEAM CRANE.
BELT CONVEYOR No 1
42 IN. WIDE × 200 FT. CENTERS., 150 F.P.M., INCLINATION 14 DEG., LIFT 49 FT., 7 PLY ¼ IN. TOP COVER, 1/32 IN. BACK, 30 HP, SLIP RING INDUCTION MOTOR, SPUR GEAR DRIVE
SCALPING GRIZZLY
48 IN. × 8 FT., FIXED-BAR GRIZZLY, MADE OF 80 LB. RAILS WITH FLANGES REMOVED, SPACING 2½ IN. BETWEEN RAILS
OVERSIZE
UNDERSIZE
SECONDARY CRUSHER
20 IN. ALLIS-CHALMERS "SUPERIOR (Mc CULLY" GYRATORY, SET AT 3 IN., 530 R.P.M., 125 HP, SLIP RING INDUCTION MOTOR, WITH REVERSIBLE DRUM CONTROL, 18 IN. × 6 PLY, DRIVE BELT, MOTOR 700 R.P.M., ACCESSORIES: (1) 10-TON CHAIN HOIST, TRAVELING ON I-BEAM FOR HANDLING REPAIRS.
BELT CONVEYOR No 2
36 IN. BELT., 247 FT. CENTERS, INCLINATION 16 DEG., HGT. LIFT 72 FT., 7-PLY × ¼ IN. TOP × 1/32 IN. BACK, 40 HP, SLIP RING INDUCTION MOTOR, 865 R.P.M., "TEKROPE" DRIVE, 8 ROPES.
COARSE SCREENS
(2) 60 IN. × 20 FT. ALLIS-CHALMERS "GATES" CLOSED END, REVOLVING SCREENS WITH 10 FT. EACH OF 2¾ IN. ROUND HOLE, CAST-MANGANESE-STEEL ⅝ IN. THICK, 10 FT. EACH OF 1¾ IN. ROUND HOLE, CAST-MANGANESE-STEEL ⅝ IN. THICK AND 8 FT. LONG PLAIN STEEL JACKETS 84 IN. DIAM. 1 IN. ROUND HOLES IN ⅜ IN. PLATE. EACH SCREEN DRIVEN THROUGH JONES WORM GEAR REDUCER BY 25 HP., SLIP RING, INDUCTION MOTOR. THESE SCREENS MAKE FOLLOWING LABORATORY RING SIZES:
OVERSIZE
2⅛ IN. TO 1½ IN.
1½ IN. TO ¾ IN.
UNDERSIZE
BELT CONVEYOR No 3
24 IN. × 216 FT. C. TO C., HORIZONTAL, 6-PLY, ¾ IN. COVER, 1/32 IN. BACK, MOTOR 5 HP. 865 R.P.M., SQ. CG., SPUR GEAR REDUCTION.
CHUTE TO BIN (1,000 TONS) OR CONVEYOR No 6 - 84 FT. C. TO C., 24 IN. × 5 PLY × ⅛ IN. TOP × 1/32 IN. BACK, HAS TRAVELING TRIPPER, MOTOR 5 HP. 865 R.P.M. SPUR GEAR REDUCTION TO
CHUTE TO BIN (1,000 TONS) OR CONVEYOR No 7 - 92 FT. 6 IN. C. TO C. 24 IN. × 5 PLY × ⅛ IN. TOP × 1/32 IN. BACK, HAS TRAVELING TRIPPER, MOTOR 5 HP, 865 R.P.M. SPUR GEAR REDUCTION TO
FINE SCREENS
(2) 4-FT, 2-SURFACE, TANDEM TYPE, 39 "HUMMER" SCREENS WITH V-32 VIBRATORS, TOP SURFACE 5/16 IN. SQ. OPENING, BOTTOM SURFACE 0.077 IN. "TONCAP"
RECRUSHER
SYMONS 4-FT. CONE SET TO 1 IN., 520 R.P.M., 100 HP, SQ. CG., INDUCTION MOTOR WITH REVERSIBLE SAFETY SWITCH, 14 IN. × 6-PLY DRIVE BELT, SERVED BY SAME CHAIN HOIST AS GYRATORY
OPEN STOCK PILE 10,000 TONS
OPEN STOCK PILE 10,000 TONS
UNDERSIZE THROUGH 10-MESH
OVERSIZE ¾ IN. TO ¼ IN.
INTERMEDIATE ¼ IN. TO 10-MESH
CHUTE TO BIN (1,000 TONS) OR
CHUTE TO BIN (1000 TONS) OR
BELT CONVEYOR No 5
55 FT. C. TO C. SAME BELT, MOTOR AND DRIVE AS No 6
BELT CONVEYOR No 9
129 FT. C. TO C., SAME BELT, MOTOR AND DRIVE AS No 6
BELT CONVEYOR No 8
154 FT. C. TO C., SAME BELT, MOTOR AND DRIVE AS No 6
TO STOCK 2,500 TONS
TO STOCK 4,000 TONS
TO STOCK 4,000 TONS.

Fig. 1. Flow sheet of Consolidated Quarries Corp. Rock Chapel operation to point of storage

bulkier duPont Extra "A" dynamite in primary blasting, but it was found that this did not give as good fragmentation as the denser and quicker 60% quarry gelatin. Extra "C" was also tried in blockholing, but there was too much trouble with breaking up and loss when cartridges were cut, so we went back to the more plastic 30% quarry gelatin.

Drilling equipment today is the same as that started with one year ago with the exception of the addition of a No. 14 Cyclone blast-hole drill. This is drilling 6-in. holes 20 ft. from the face and 18 ft. apart. Holes are drilled 5 ft. below the quarry floor and average about 75 ft. in depth at the present time. The drill has averaged 2 ft. per hr., including moving time. This drilling is being done for comparison of costs and results with tripod-mounted, hammer drilling. To date the blast hole drill has shown a saving in drilling cost of 3.2c per ton. Results to date indicate that, due to increased blockholing with blast-hole shooting, "overall" costs of the two methods will be very close.

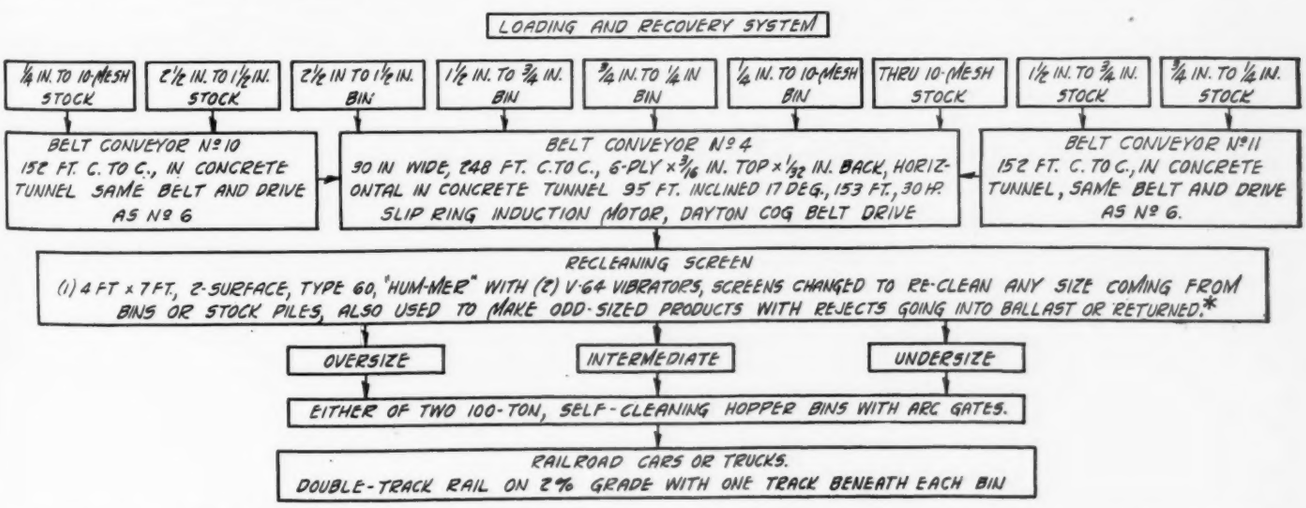
Our first blast hole shot was "pulled" June 11. It consisted of 24 holes, which broke a calculated tonnage of 43,680. It was loaded with 3650 lb. of 75% quarry gelatin and 7100 lb. of 60% quarry gelatin (5x16-in. cartridges), a total of 10,750 lb. or 4.06 tons of rock per pound of explosives. This is practically the same loading as has been used in the smaller holes. The rock was "pulled" out nicely, leaving a clean face, but fragmentation was poor, there being several pieces larger than an ordinary room and little material which did not have to be blockholed before use. This first shot indicated much poorer conditions for shoveling due to burying of many large pieces which cannot be reached for blockholing until they are uncovered by the shovel.

The burden on the second shot, "pulled" August 16, was cut down to an average of about 16 ft. Spacing could not be changed, as the holes had already been drilled at the time of the first shot. The second shot broke 16,650 tons of recoverable stone with 2550 lb. of 75% and 2750 lb. of 60% quarry gelatin or 3.14 tons per pound of dynamite.

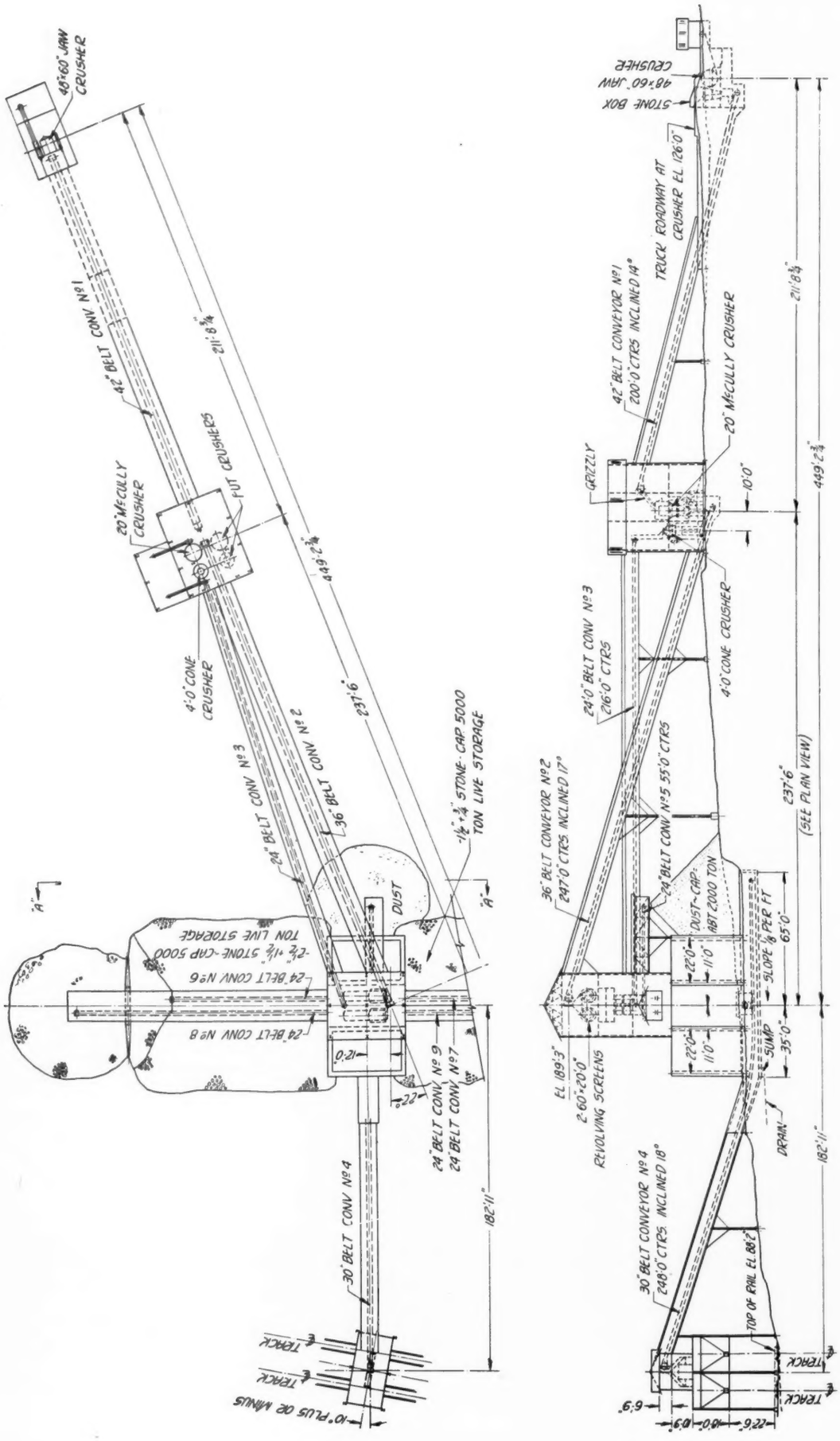
Fragmentation this time was fairly good and the face was again "pulled" clean. Drilling for the next shot is being spaced 18 ft. x 20 ft. with the hole size reduced to 5⅝ in. so that the charge will "build up"

Face of quarry before first blast-hole shot June 11, 1930

Result of the first shot, which indicated need for reducing hole spacing and burden


LOADING AND RECOVERY SYSTEM
¼ IN. TO 10-MESH STOCK
2½ IN. TO 1½ IN. STOCK
2½ IN TO 1½ IN. BIN
1½ IN. TO ¾ IN. BIN
¾ IN. TO ¼ IN BIN
¼ IN. TO 10-MESH BIN
THRU 10-MESH STOCK
1½ IN. TO ¾ IN. STOCK
¾ IN. TO ¼ IN. STOCK
BELT CONVEYOR Nº 10 152 FT. C. TO C., IN CONCRETE TUNNEL SAME BELT AND DRIVE AS Nº 6
BELT CONVEYOR Nº 4 30 IN WIDE, 248 FT. C.TO C., 6-PLY x 3/16 IN. TOP x 1/32 IN. BACK, HORIZONTAL IN CONCRETE TUNNEL 95 FT. INCLINED 17 DEG., 153 FT., 30 H.P. SLIP RING INDUCTION MOTOR, DAYTON COG BELT DRIVE
BELT CONVEYOR Nº 11 152 FT. C. TO C., IN CONCRETE TUNNEL, SAME BELT AND DRIVE AS Nº 6.
RECLEANING SCREEN (1) 4 FT x 7 FT., 2-SURFACE, TYPE 60, "HUM-MER" WITH (2) V-64 VIBRATORS, SCREENS CHANGED TO RE-CLEAN ANY SIZE COMING FROM BINS OR STOCK PILES, ALSO USED TO MAKE ODD-SIZED PRODUCTS WITH REJECTS GOING INTO BALLAST OR RETURNED.*
OVERSIZE
INTERMEDIATE
UNDERSIZE
EITHER OF TWO 100-TON, SELF-CLEANING HOPPER BINS WITH ARC GATES.
RAILROAD CARS OR TRUCKS. DOUBLE-TRACK RAIL ON 2% GRADE WITH ONE TRACK BENEATH EACH BIN

Continuation of Rock Chapel flow sheet, showing recovery and loading system—*Returned to crusher by motor truck



Elevation and plan of the Consolidated Quarries Corp. Rock Chapel operation at Lithonia, Ga.

faster in the hole and less stemming will be necessary.

This will be loaded three tons of stone to the pound with 75% and 60% about equal. Previous shots indicate that this amount of dynamite will not throw stone out of the quarry, a factor that has caused caution hitherto, as the primary crusher and shops are directly in front of the quarry face and only about 300 ft. distant.

In secondary drilling, experiments have been made with lighter "Jackhamers" and ⅞-in. steel, using smaller bits than are possible with 1-in. hollow hexagonal steel. These experiments indicate that greater drilling speed with less air consumption and a lighter drill to be carried around can be obtained where blocks are not too large. It has also been found that the use of steel without collars on shanks greatly increases the drilling speed of some drills in this rock. This offers a considerable saving in steel breakage and wear of chuck bushings in the machines also.

Thus, at the present time, we are using our original four Ingersoll-Rand, S-49 hammers with 1-in. steel for drilling after a primary break with two I.-R., R-12, and two Denver-11 hammers on collarless ⅞-in. steel, drilling shorter holes in rocks laid back by the shovel. These smaller holes are 1¼-in. in diameter and are loaded with 1- by 4-in. 30% quarry gelatin.

From comparisons made of "mudcapping" and "blockholing," it was concluded that, with all costs included, it cost 34c to break an average size block (6 ft. x 4 ft. x 3 ft.) by blockholing and 79c to break the same size blocks by mudcapping.

The presence of numerous cut-stone quarries in this vicinity working on rock similar to ours suggested the possibility of splitting blocks by their method of short holes and wedges. The costs by this method proved to be about the same as by blockholing, but the uniformly large size of fragments thus secured somewhat slowed down the shovel operation.

Loading, Hauling and Crushing

Our installation for loading and hauling to the primary crusher has proved entirely satisfactory and economical. The Bucyrus 100-B electric shovel has been very reliable and has loaded as high as 1900 tons in 10 hours. If the three Autocar trucks were to be replaced we would specify heavier frames, spring hangers and driving axles, as these parts have given some trouble; but the trucks have lost very little operating time for repairs.

The primary crusher installation follows the usual practice except for accessories. Reversible drum control of the motor drive and overhead crane with suspended air hoist and chain hoist have proved valuable many times. We have never had to clean out the crusher after a power failure. The reversed motor with the aid of bars or the air hoist on the flywheels has always been capable of starting under full load. This has been a time-saver many times, particularly during the summer when electric storms caused the circuit breakers to open frequently.

Flat-bottom, stone-filled, chute boxes here, as elsewhere in the plant, have saved wear on liners. I believe that lowering the speed of this crusher from 170 r.p.m. to about 125 r.p.m. would be beneficial in lowering peak motor loads. It should then have a capacity of better than 200 tons per hour when set at 6 in., and this amount would be ample. Bearing life would also be lengthened by this change. This change has not been made, as there has been a constant possibility that production would have to be pushed beyond this point in the near future.

One-half of the set of jaw plates were replaced at 330,000 tons. The other half will be replaced at about 400,000 tons.

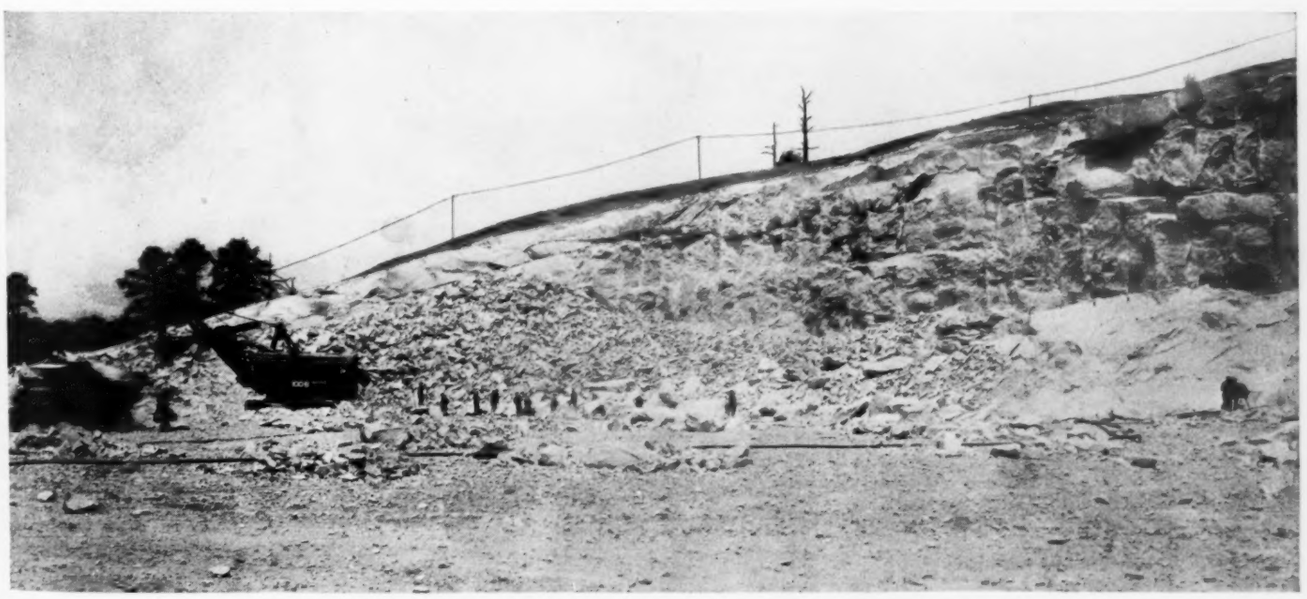
Maintenance of Conveyors and Crushers

The 42-in. conveyor taking material from primary to secondary crushers is of ample width so that practically no spill has occurred and its relatively slow speed (150 f.p.m.) seems to be about the best for such coarse feed. We intend to replace the pinion and gear drive at an early date with a drive of the V-belt type, for excessive vibration loosens and breaks the end rotor connections in the slip-ring motor. Also the life of the motor pinions is short (three to six months), causing high maintenance cost for this type of drive.

The secondary crusher has given a good account of itself with the exception of a fairly short life for the eccentric bearings. The average for these is about eight weeks. This is due to the highly abrasive quality of dust, which is not effectively excluded. The lower concave liners were replaced in this crusher at about 160,000 tons, after having been set out once at about one-half of this tonnage. The lower section of the mantel was replaced at 260,000 tons. The upper sections in each case have not yet been removed and indicate a life of at least 500,000 tons.

The Symons cone crusher has proved capable of reducing all production to through 1½-in. ring, when running at full capacity. The bowl liner and mantel in this crusher were replaced when it had handled about 100,000 tons. This tonnage corresponds to a total through the plant of about 250,000 tons.

Due to congestion at the feed chutes, heating of the motor, and the same vibration trouble as mentioned above, the drive of conveyor No. 2 has been changed. A 30-hp., slip-ring motor was replaced with a 40-hp., and the gear and pinion drive replaced with a "Texrope" drive, increasing the speed of the belt from 165 f.p.m. to 210 f.p.m.



Handling stone from the newly opened Rock Chapel quarry

The garage, machine shop and crushing plant as seen from the quarry

Screens

The original ⅜-in. thick, plain steel, punched plates on the revolving screens were replaced when worn out (at about 200,000 tons) with ⅝-in. thick, cast-manganese-steel plates, except for the jackets, which have not yet worn out. We have spring-steel, woven-wire screens here to replace these jackets and expect to get a somewhat better separation by this change. The following sizes of round holes are used to produce corresponding laboratory, ring-size material: 2¾-in. for 2½-in., 1¾- in. for 1½-in. and 1-in. for ¾-in. Chutes under these screens are so arranged that 2½-in. to 1½-in. may be returned to the recrusher with oversize, when the demand for smaller sized stone predominates.

Two 4-ft. tandem, two-surface, "Hummer" screens handle through ¾-in. material from the revolving screens, separating it at ¼-in. and 10-mesh, with an efficiency of 96% on the ¼-in. and 89% on the 10-mesh. The 5/16-in., square-net-opening, steel-wire screen is used on the top deck and 0.077-in. "Toncap" screen cloth on the bottom deck. The life of these is about 25,000 tons of feed to screen.

Stocking System

No changes have been made or are contemplated in distributing conveyors to stockpile, except the change from pinion and gear to V-belt drive mentioned before. Uniform width (all 24-in.) and interchangeability of drives (all 5-hp.) of these conveyors have proved valuable in reducing stock for repairs. If we were again putting in the stockpile system, we would in all probability make one important change.

This would be to excavate for and lower the recovery tunnels to where they were a distance below ground level about equal to the height of the stockpiles above. This change would double the amount of total storage and quadruple the amount recoverable without dragging in to conveyor chutes. As is, about one-half of total storage is recoverable by belts alone. We contemplate putting in a small scraper and hoist system soon to make available the remaining one-half.

The drive of the No. 4 conveyor from stock to cars has recently been changed over to a Dayton "Cog-Belt" to get away from the gear vibration mentioned before.

Overcoming Segregation—New Developments

Due to the accumulation of fines in the center of stockpiles and excessive drawing of this segregated material at some times, it was found advisable to install a re-cleaning screen over the loading bins. This is a 4-ft., two-surface, Type 60, tandem "Hummer" vibrator. It is so arranged that any product can be put into either bin or material can be bypassed into either bin without screening. The screen cloth is changed here to suit the size of stone being re-cleaned.

At the present time, considerable experimental work is being done on the production of washed sand from screenings for concrete, brick mortar and plaster work. We have built and installed a small Anaconda type hydraulic classifier which produces about 50 tons of washed sand per 10 hours. This has been operating about two months and the product has been entirely satisfactory both as to sizing and concrete strength requirements. As soon as the market for this material justifies, a classifier of more ample capacity will be installed.

Two small but important buildings have been added since the plant was started. One is an oil house, centrally located, where all lubricants are kept. One man is responsible for maintaining this stock. The other building is a testing room at the loading bins. This is equipped with splitter, test screens, scales, shaker, etc., all equipment necessary to run screen tests and weight per cubic foot tests.

Concrete-Steel Construction Pays

Concrete-steel construction throughout has aided in maintaining a neat and clean plant which, in turn has helped maintain safety and efficiency. These factors cannot easily be computed in dollars and cents saving, but there is no doubt of their value. I believe that the expense and care put into design and construction here have paid, for rated capacity was easily reached within a few weeks after starting and maintenance repairs since then have been low. Only time-proven machinery was used in each operation, and although there is a possibility that machines of a more experimental nature (for example vibrating screens for coarse screening in place of revolving screens) might have proved more effective in some cases, there is also the probability that they would have caused some unforeseen troubles when the plant was started.

Asphalt Paving Mixtures Described in Bulletin

THE Asphalt Institute, New York City, has published a 20-page bulletin, with cuts and charts, comprising three papers by Prevost Hubbard on "Principles of Design," "Stability and Related Tests," and "Application of Test Results," covering sheet asphalt paving mixtures.

The first paper discusses the principles of design in the light of the most recent research and the relation of the factors controlling stability (or resistance to displacement by traffic) and durability. The second paper describes in detail the standard methods of preparing samples and making tests and the machines used. The third paper points out the importance of stability tests in evaluating the sand and fillers, determining the best design, controlling the plant operation, and securing proper compression on the street when applying.

It is brought out that stability, or resistance to rutting or shoving, is dependent upon the mixture used and upon the initial compression or rolling when it is put down. It has been found that stability varies greatly for different sands and fillers, and also that for any properly designed mixture stability varies almost directly as the initial compression.

Studies so far made indicate that for resistance to rutting or displacement under heavy traffic, the mixture should have a stability of preferably about 2000 lb., but not less than 1200 lb.; that for durability the weight of asphalt should not be less than 9%; and that the voids should not be less than 2% nor more than 5%. It has been found that the voids play an important part in taking care of the expansion of the asphalt, which has a high coefficient of expansion compared with the aggregates. The stability test mentioned above is an arbitrary measure of the maximum load developed in forcing the mixture through a standard orifice, at a temperature of 140 deg. F.

Paving mixtures vary considerably but a fair average would be 75% sand, 15% filler and 10% asphalt by weight. In considering the proportions by volume the specific gravity of the sand and filler may be taken as 2.65, and of asphalt as 1.03, and on the basis of volume the mixture would consist of 78% mineral aggregates and 22% asphalt. After rolling, this assumed average mixture might show 3% voids, 76% mineral aggregates and 21% asphalt.

The Manufacture of Gypsum Plasters

Part III—Some Cost-Saving Suggestions

By A. M. Turner, E.M.
La Veta, Colo.

IN ALL MANUFACTURING INDUSTRIES TODAY there is a decided tendency toward intensive cost reduction. The gypsum industry has accomplished most gratifying results in its efforts in this direction.

I have written this article with the idea of listing numerous methods and processes relative to economic factors in the manufacturing of gypsum products and believe that at least some of the suggestions will be helpful to the operating man in effecting still further cost reduction.

Major changes in the economies of plant operation are usually governed strictly by local conditions and to a great extent automatically adjust themselves. For instance, large savings may be accomplished by changing the kind of fuel used, but this is generally determined by the advent of coal, gas, or oil to the locality of operations. Likewise, the conversion from manufactured to purchased power is regulated by the existing condition at the locality in question. Assuming average conditions and prices for fuel, it is generally true that the economical fuel to use is natural gas, fuel oil, and coal, in respective order given. The advantages of purchased power on the average outweigh those for the use of manufactured power.

I will not dwell on the subjects mentioned above, as to give information on them which should prove of real value to the operating man would require lengthy, detailed analysis, and even then a generalization could hardly be given which would be applicable for all conditions. In other words the answer to these problems comes about much like the old adage, "The wheel that squeaks loudest gets oil first."

Following are listed numerous definite methods that involve cost reduction possibilities. Most of these suggestions are extremely simple, but in all probability the mill man is going to find he has not taken full advantage of some of the possibilities mentioned.

Hand Operations vs. Mechanical Equipment

On first impression when considering converting from hand operating to mechanical methods, the latter is favored. However, great caution must be observed if operations are on a relatively small scale, for it is often a fact that the depreciation and interest on the investment of a piece of machinery can amount to more per day, or per unit of production, than the total cost of labor for the same operation.

I have seen this condition clearly illustrated in quarry workings on a small scale. Several men and teams were used full time on an operation which could have been handled with a power shovel and two men working half-day shifts. At first the purchase of a shovel appeared to be a real asset toward cost reduction, but after a scientific analysis, figures proved that the depreciation of the mechanical equipment plus the interest on its investment was equal to the total cost of mining with horses and men.

Editor's Note

EVERY PRODUCER in the rock products industry could read this article with profit. While it refers specifically to gypsum products manufacture, listing and describing the sources of many small leaks which in toto add appreciably to costs, the article also illustrates the method of attack to reduce operating costs in any rock products manufacturing operation. Particular attention is paid to tracing the shrinkage of output between quarry and shipment of the finished product. These are the actual leaks of processed or partly processed material which result in the figurative leaks in profits.

Quarry Expense

One of the largest items of expense in quarry operations is that of dynamite, especially when purchased in small quantities. A good chance for reducing this cost (providing the extent of operations is sufficiently large) is to build a powder-storage magazine and then buy the explosive in large quantities, thus lowering the purchase price very materially. Often a co-operative plan can be established with neighboring industries whereby a pool car of material may be purchased, giving each company the benefit of car-load rates. This scheme has been successfully applied by competitors producing the same products.

Shrinkage

The subject of shrinkage in the gypsum industry is one of paramount importance, yet a subject which is overlooked, misunderstood, and abused generally. Without a definite knowledge of what shrinkage is and how calculated, the production of stucco from gypsum cannot be scientifically regulated.

While converting gypsum to stucco there is a definite theoretical shrinkage due to the chemical change of gypsum ($CaSO_4 \cdot 2H_2O$) to stucco ($CaSO_4 \cdot \frac{1}{2}H_2O$). Although this conversion does not take place in the form of a perfect and complete chemical reaction, it nevertheless is so close, if calcination is correct, that the operator can safely work on the basis of a complete conversion. In other words, the calcination of gypsum ($CaSO_4 \cdot 2H_2O$) to stucco ($CaSO_4 \cdot \frac{1}{2}H_2O$) involves a shrinkage of 15.7%. This shrinkage represents but part of the total loss, and the remainder, which may be considered physical loss, is caused by driving off free moisture from the raw material, the escape of stucco as dust from the kettles, and leakage through equipment.

The plaster-mill operator by means of average figures taken over a period of time learns the actual shrinkage between raw material and the finished product. If he will compare this figure with theoretical loss which may be found by the following formulas, he can actually see in figures the percentage of material which might be saved, and a goal is established toward which to work.

Following is a simple series of calculations to demonstrate a method for calculating shrinkage.

KNOWN FACTORS

A = Weight of raw material (gypsum, impurities, free water).
B = Weight of free water in raw material. (Knowing the % free moisture in sample the weight of it may be calculated.)
C = % gypsum in raw material.
D = 84.3% stucco ($CaSO_4 \cdot \frac{1}{2}H_2O$) derived from calcining gypsum ($CaSO_4 \cdot 2H_2O$)

UNKNOWN FACTORS

E = Weight of gypsum in raw material.
F = Weight impurities in raw material.
G = Weight stucco available from gypsum.
H = Weight stucco and impurities in finished product.
I = Weight lost by shrinkage.
J = Percentage shrinkage.

SOLUTION FOR UNKNOWNS

$$E = \frac{A \times C}{100}$$

$$F = A-(B+E)$$

$$G = \frac{E \times D}{100}$$

$$H = G + F$$

$$I = A-H$$

$$J = \frac{I \times 100}{A}$$

EXAMPLE

A = 100 lb. = Weight of raw material.
B = 3 lb. = Weight of free water.
C = 95% = Gypsum in raw material.
D = 84.3% = stucco derived from calcining gypsum (constant).

THEREFORE:

$E = \frac{A \times C}{100} = \frac{100 \times 95}{100}$ = 95 lb. = Gypsum in raw material

$F = A - (B+E) = 100 - 98$ = 2 lb. = Weight of impurities in raw material.

$G = \frac{E \times D}{100} = \frac{95 \times 84.3}{100}$ = 80.1 lb. = Weight stucco from raw material.

$H = G + F = 80.1 + 2$ = 82.1 lb. = Total weight material after calcination.

$I = A - H = 100 - 82.1$ = 17.9 lb. = Weight shrinkage.

$J = \frac{I \times 100}{A} = \frac{17.9 \times 100}{100}$ = 17.9% shrinkage.

By the above formulas it is a simple matter to calculate the unavoidable shrinkage; and the difference between this figure and the actual loss is the stucco which should be saved to swell the credit column of the operator's ledger.

By far the greatest amount of this loss is accounted for by the stucco dust which leaves the kettle through the steam pipe. It is not out of line to find that there is from 1 to 3% loss from this source.

The accompanying sketch (Fig. 4) shows a cross-section illustrating a method for recovering a large proportion of dust which might otherwise be lost. Dust and steam leave the kettle through the steam pipe and enter the catinary dust bin. A steel diaphragm is suspended from the top of the dust chamber right through the center and to within a short distance of the bottom. As indicated by the arrows the dust suspended in steam shoots directly to the top of the bin where its course is deflected, and the mixture drops down the side of the diaphragm. As most of its velocity has been lost by this time the dust settles in the bottom of the bin and the steam continues its course through a vent pipe joining the kettle stack.

There are various modifications of this principle used, and to better control the draft through the dust bin, it has been found practicable to run a pipe from near the bottom of the kettle stack to the steam pipe above the top of the kettle. By use of a damper in this stack a very accurate draft can be maintained. Spouts with slide gates are provided in the bottom of the dust bin, and these feed into a conveyor C, which discharges into the spout D, bringing the dust back to the kettle. It is imperative that the dust be continually drained from the bin with the exception of a short time before dumping the kettle. This will help assure uniformity of product.

The other avoidable stucco losses occur through leaks in equipment, and this condition can easily be remedied by mechanical repairs and improvement.

Charging Kettles

The usual practice for charging kettles is to run a stream of ground gypsum directly into them in such a way that all the raw material goes into one definite section of the kettle. Therefore it requires considerable agitation to effect a uniform mixture of raw gypsum and that which is partly cooked. A certain mill operator conceived the idea of placing a baffle at the bottom of the kettle feed spout in such a position that incoming material would be fed uniformly over the surface of the material already in the kettle, and in this way a thorough mixture was obtained in a much shorter period of time.

The result was, according to the operator making the experiment, that the time of calcination for a kettle of gypsite was reduced from 4 hours to 3½ hours. In all probability this scheme would be much more effective for gypsite than for gypsum.

Tests have proved that it is more economical to charge a kettle to full capacity rather than partly fill it and cook more batches. The explanation for this is that the kettle shell is heated to practically the top, and as long as there is no material in contact with the upper part of the kettle, heat in this section is almost completely lost. Also each time a dump is made there is a time loss; so if, for instance, one less batch is cooked during a shift it saves the time required in dumping a kettle.

Kettle Firing

Kettle firing and calcination are done largely according to individual's various personal whims, which, in some instances, almost border on the superstitious. To a large extent this process can be handled on a scientific basis by the use of scientific control instruments. A recording thermometer used in kettles is now the general practice and is absolutely a reliable guide when the instrument is kept in accurate adjustment.

Firing of kettles in general is handled by means of one operator handing down his ideas and experience on the subject to the next operator. This method is not accurate since each individual's interpretation of the same phenomenon is different.

By the use of a pyrometer in the kettle stack and analysis of flue gas much more efficient results may be obtained from fuel.

By referring to the diagram, Fig. 4, A represents the place in the kettle stack where a pipe may be

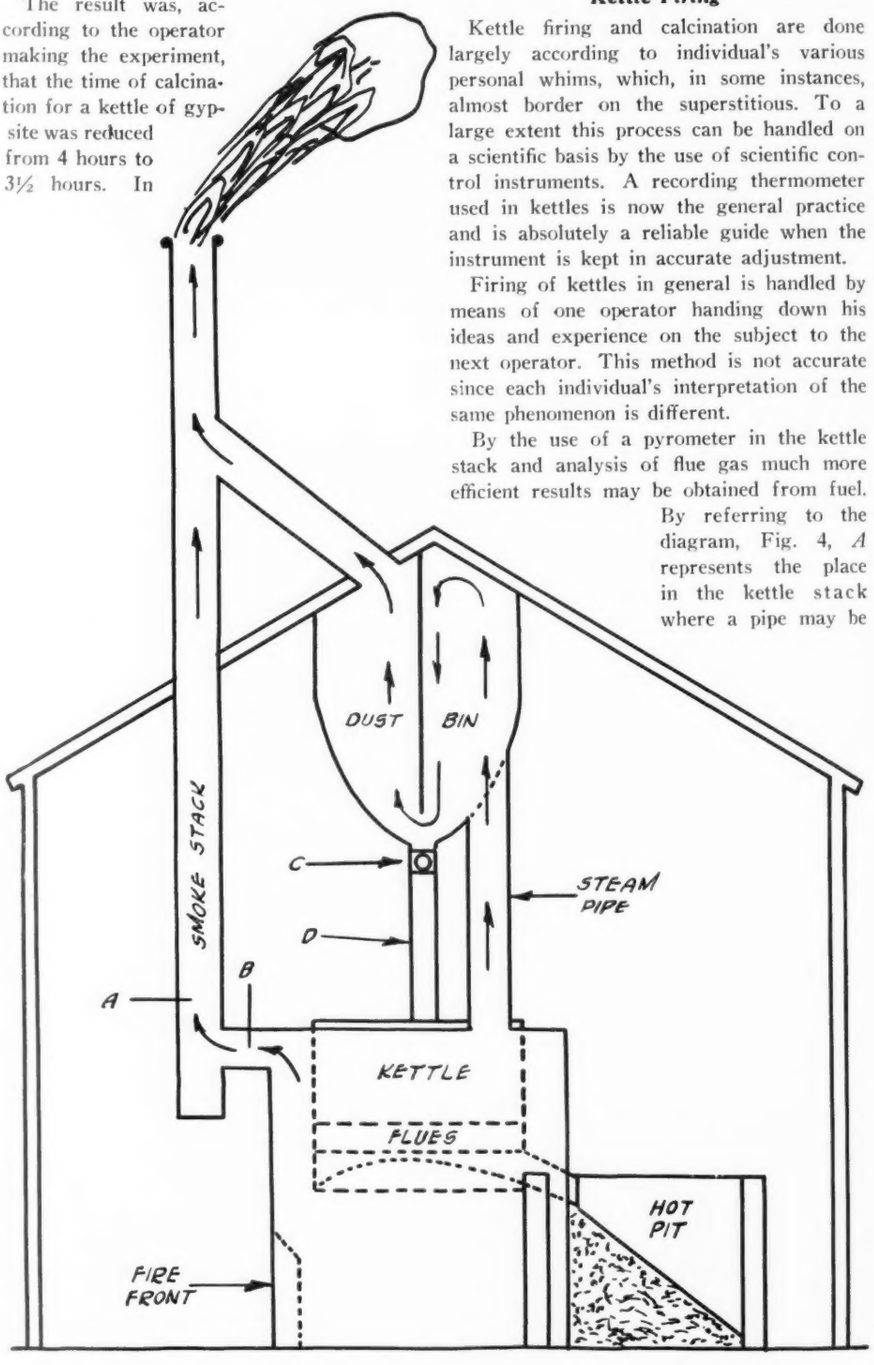


Fig. 4. Cross-section illustrating method of recovering a large proportion of dust leaving the kettle

inserted through which to take gas samples, and *B* the location of the pyrometer tube. By making a series of tests on temperature and gas analysis, information may be obtained showing a maximum temperature which can be maintained with a high efficiency of fuel combustion. After determining the ideal combination to use, the operator can be given figures for temperature and gas composition to use for his guide. Firing a kettle by the look of the fire and color of smoke is a guide which can be used, but is certainly not the most efficient method. In addition to the instruments above mentioned a draft gage may be used to advantage to measure the draft in the fire box, and by this means another ideal factor toward which to work is obtained.

Power for Kettle Agitation

The amount of power required to operate a kettle is determined by the resistance the rabble arms encounter while stirring the kettle contents. This resistance is governed by the angle at which rabble arms are placed in respect to a horizontal plane.

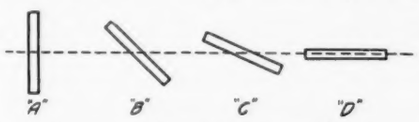
This feature can better be illustrated by the sketch, Fig. 5, which shows four cross-sections of rabble arms in different positions. Here, *a* illustrates a vertical position which would give the rotating arm the maximum load to work against while the positions *b*, *c*, and *d* lessen the load respectively, until the minimum resistance may be had by the arm being placed parallel to a horizontal plane. It should be kept in mind that the kettle agitators must serve the function of keeping the gypsum from collecting on the kettle flues and also agitate the gypsum sufficiently, but this should be accomplished with the minimum amount of power in order to have the most economical calcination. The conditions just described were previously mentioned in my first article of this series, but it is without doubt a most important factor which can easily be overlooked. I have seen kettles frequently stick simply because the angle of the rabble arms to the horizontal was too great, causing more resistance than the kettle power transmission equipment was able to take care of.

Leaving Stucco in Hot Pits

Considerable investigating has been done to determine the transition of stucco which is allowed to remain in hot pits for a long period of time after the kettle has been dumped. There is no question that when calcined gypsum lies in the hot pit there is a condensation of hydroscopic moisture which may cause particles of set plaster to be formed. On the other hand, part of the material in the hot pit becomes over-heated and completely dehydrates giving a resulting product which is much slower setting than normal stucco. For these reasons the general practice of gypsum manufacturers is to always empty the hot pits immediately after the kettles have been dumped. In the case of a one-shift operation this practice leads to additional expense on account of having to keep one or two men overtime to empty the hot pits of the last batch of stucco.

The evils of stucco deteriorating if left in the hot pits may be largely overcome by installing a vent pipe from the top of the hot pit to the steam pipe over the kettle. This allows the hydroscopic moisture to escape and the stucco to cool considerably. The result is that stucco may be left in the hot pits over night with no serious damage to quality. Care should be taken, however, to follow a consistent plan of either leaving the stucco in the pits over night or else always elevating it, for the simple reason that uniformity in process methods for manufacturing gypsum products is of paramount importance.

While on the subject of hot pits, the precaution of installing an iron grating at the discharge of the kettle gates to trap tramp iron (as illustrated in Part 1 of this series of articles) may well be mentioned at this time. Damage to equipment and delays in operation caused by pieces of iron getting into the flow of material can play havoc with operating costs.



CROSS SECTION RABBLE ARM ILLUSTRATING FOUR POSSIBLE POSITIONS.

Fig. 5. Showing relative positions of rabble arms to produce maximum agitation with minimum amount of power

Fibre

The gypsum industry has seen a radical change in regard to the practice of fibering plaster. Not many years ago the fibre used consisted entirely of hair, either goat or cattle, the former proving to be most efficient. However, the cost factor involved in using hair proved to be an important issue, so the practice was begun of using a mixture of sisal and hair fibre, the sisal being much cheaper than hair. At first a small proportion of the cheaper fibre was used but rapidly the amount was increased until at present in many cases the hair is entirely omitted. Another condition which has come as a result of the many efforts to reduce manufacturing costs is lessening of the amount of fibre used in plaster. As a matter of fact it is very doubtful if the small amount of fibre generally added to stucco by most manufacturers is of any material value whatever.

A field where a very definite possibility for cost reduction to the operating man lies is in the hands of the plaster salesmen and others who contact consumers. Hundreds of pounds of fibre are screened out of plaster to prepare the material for brown coat use. Sufficient missionary work in the field would stimulate the use of unfibred plaster in its proper place, with the result that the producer would use much less fibre and save the work of mixing it with stucco.

Mixing

Many companies are overlooking a good opportunity by not picking fibre directly into the mixer. This method not only saves at least one-half of the supply man's time but assures a more intimate mixture and is less of a strain on the agitators, because fibre enters the chamber in small fragments rather than in bunches.

The neck of the bottle controlling output in production in the sacking department is usually the time which has arbitrarily been set as a standard for mixing stucco with its ingredients. The other factors regulating output at this point of production can usually be speeded in proportion to meet requirements without a great deal of ingenuity. As a contribution toward a possibility for overcoming the rate of production control (time required for mix) I am going to offer three suggestions:

1. Increased capacity of mixers.
2. Operation of two mixers in conjunction with one packing machine.
3. Continuous mixing device.

The above suggestions are not proven solutions to the problem involved but may at least merit consideration.

Frequently a shaft with agitating arms is installed in the hopper above the packing machine for the purpose of hastening the flow of plaster to the sacker. This plan helps little if any to accomplish the desired results, and the power required to operate this device might just as well be saved. A successful plan to prevent plaster from sticking in the hopper, above referred to, is to blow compressed air into the material in the hopper. To accomplish this an arrangement of pipes may be attached to the container above the packing machine and the necessary pressure of air turned on as required.

Bags

It has been successfully demonstrated in recent years that by using a paper bag shorter but wider than the customary one, the same weight of plaster will be held in a container which requires less paper to make. Since the price of the bag is governed by the amount of paper it contains this innovation has meant a substantial saving in bag costs.

A fact worthy of consideration regarding this subject is that cold stucco is more compact than that which is hot, so if it is possible to sack comparatively cold plaster the minimum size container may be used.

Weights

Perhaps sufficient consideration is not always given to accuracy of the weight of the bags as they are taken off the packing machine. An overweight average of only one pound to the bag can result in a loss equal to several tons of plaster a day at a large producing mill. This error is most

likely to occur when the packing department and calcining mill are managed by different men, since a loss through this source is reflected back to the calcining mill and mine, rather than the packing department.

Weights from an automatic packing machine are sufficiently dependable for all practical purposes if the operators use reasonable care and the free service of the companies making the packers is enlisted. The operator who will not co-operate with the service men sent out by packers' manufacturing companies, who are experts in making adjustments to packers, certainly is not benefiting his own employer.

Car Loading

It may be needless to mention various details necessary to simplify car-loading problems but nevertheless if the various little short cuts are not observed the numerous delays which can enter into operations mount up to material production losses.

In the first place, by proper loading-door or platform arrangements and convenient switching service there is seldom excuse for loading delays through waiting for cars to be spotted. This being done, the next consideration is to carefully study the orders to be filled so they can be taken care of in the most efficient manner possible. By this I mean that it is usually possible to load the fibred material in several cars before cleaning out the mixer to run unfibred material, or sack several orders in paper bags before changing to the use of jutes. Adjusting weights, changing bags or cleaning the mixer are all processes which consume time and cut down the speed of production.

Since multi-wall paper bags have reached their present degree of perfection there is no longer a necessity to pile bags in cars by hand. This fact reduces the loading crew by one man besides speeding up the time required for trucking. Even when loading as little as 15 tons of plaster, bags may be dumped from the truck in each end of the car, and if properly executed the load will carry without damage.

The occasional expense incurred by demurrage is in most cases avoidable if good judgment is used. An unquestionable asset in this respect, but something which has been overlooked at times, is the advantage of entering into an average agreement contract with the railroad whose service is being used. This agreement provides for the manufacturer to receive credits on cars which are loaded or unloaded in a certain length of time to apply on debits for those which are held longer than the specified time limit.

I have not written this article with the view of suggesting to the gypsum manufacturer operating man some methods whereby his cost problems may be enormously reduced, as by the snap of the finger, so to speak. As stated in the beginning, the big individual transformations will to a large extent automatically be regulated. However, the gypsum products producer who is ahead of the average will capitalize on all the smaller possibilities for saving a few cents a ton here and there, which, when grouped, amount to a large sum, and marks the dividing line between success and failure.

(To be continued)

Rock Products Producer's Paradise

On the Edge of Death Valley, California

By Charles Jenkins
Pacific Minerals Co., Ltd., Richmond, Calif.
(Dedicated to Mrs. Charles Jenkins)

THERE MAY BE spots situated at various places in the world that have been through primitive upheaval. I have my doubts if there exists another spot where the upheaval has been so complete as this particular mountain range, so fittingly named the Calico Mountains, California. The merchant who gaudily displays his wares of calico has no comparison to the color display nature has put in evidence in this locality.

I had the pleasure of visiting the famous old Calico silver mine, situated about 10 miles from Barstow, Calif., in the mountains from which it took its name. This mine in the early days of boom silver was a heavy producer, but was closed down when silver fell and for many years lay idle. Those ghostly days are gone, for the Zenda Mining Co. has reopened the famous old mine and the old adobe stores and dwellings are alive with human beings once more. The mine is nestled in a canyon that is a wonder to behold, the reds, greens, blues, yellows and many other colors are blended into shades that even the famous dye manufacturers have failed to duplicate.

All the Useful Minerals in One Setting

Calico Canyon is open for automobile travel for miles and is a geologist's dream, for here Old Mother Nature has turned everything she has wrong side out. The various strata of rock are laid bare in every conceivable shape and color, some standing on end, some flat and at practically every angle imaginable. This entire range of mountains disgorges such minerals as gold, silver, copper, platinum, lead and many others, as well as practically every nonmetallic in known existence. There is barium, borax, limestone, gypsum, silica, feldspar, mica, jasper, bentonite, talc, diatomaceous earth and many, many more.

Twelve miles from Barstow in a northeasterly direction are the fossil beds, where the bones of prehistoric men and animals are being unearthed by a group of geologists from the American Museum of Natural History, New York City. I personally inspected some of the bones dug up, which were finely preserved in a coating of blue clay. Some had the appearance of human jaw bones with the teeth still intact. Others had the appearance of vertebrae, and some of leg and arm bones. I failed to see any skulls.

A few hundred yards to the right of these excavations there is a cliff of approximately 200 ft. in height. It forces one to stand in awe, for at first appearance it forms the impression on your mind of an ancient city, with the crumbling pillars of bygone splendor, and in fact the longer one gazes at this wonderful erosion of nature the more realistic it appears. To the right of this spectacle is a very large hill that looks as though some giant had taken his cleaver and sliced it in two, leaving the halves exposed in layer upon layer of various colored rock.

A few miles farther along this road of never ceasing wonders are the ancient Indians' "billboards," where in the cliffs of solid rock they chiseled their beliefs, fears and fortunes.

Nine miles to the east of Barstow lies Dry Lake, an enormous dry lake bed as level as a table top and an inspiring sight from the top of the surrounding mountains.

Red Roofing Granules From Native Rock

The Barstow plant of the Pacific Minerals Co., Ltd., is situated here, it being the largest and finest equipped plant on the Pacific coast engaged in the manufacture of roofing granules. In this locality is found the beautiful red rock used to surface the shingles made by the six large roofing companies on the coast. These beautiful shingles cover lovely western homes from Canada to the Mexican line. Blended by artists in the big plants, this type of roofing brings to a home a look of beauty that cannot be duplicated by a master painter and his brush. These plants are ideally located in the heart of a country supplying the trade with a rock of such beautiful color, not to be found elsewhere in the world.

It has been a pleasure to me indeed to be enabled to become acquainted with this interesting locality, and I sincerely hope some of you who read this article will some day visit this section of the old southwest and see for yourself the wonders that abound. True is the old saying, "The lure of the desert." It grips you body and soul after a short stay, and forever lures you back, once you leave. But as it is one of the healthiest spots in the world, it leaves you with no regrets when you are lured back again.

California's Minerals

CALIFORNIA continues to produce commercially more than 50 different mineral substances, total value of which for 1929 was $398,000,000.

Small Sand and Gravel Pumping Operation Shows Originality

Batavia Washed Sand and Gravel Co., Batavia, N. Y., Newcomer in the Field, Has an Inexpensive but Efficient Plant

By George M. Earnshaw

ALMOST everyone has heard the old quip, "When Greek meets Greek, they start a restaurant." This one is about five men (not Greeks) who met this year and started a sand and gravel operation; a brand new one. They didn't have any experience in the industry, but they did have a lot of determination; they didn't have any too much money, but they had brains. Today they have a fine 600-yd. per day plant that's making money and they have plans to eventually expand to operate on a much larger scale.

An interesting little plant designed and built in 60 days' time

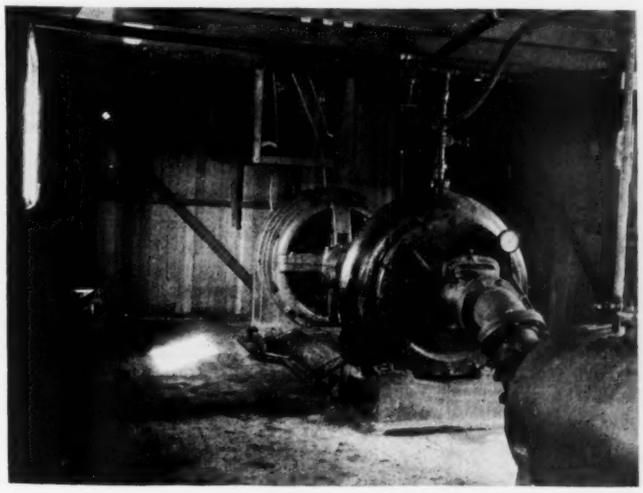
These men are F. G. Feitshans, president and general manager, who designed and superintended construction of the plant; John Wade, vice-president; G. T. Walker, treasurer; F. R. Miller, secretary, and Frank Geyick. They obtained a 38-acre piece of property having a 40-ft. deposit of sand and gravel, which property had previously been stripped of a 15-ft. stratum of gravel by the New York Central railroad. The main line of this road divides the property into two parcels of 20 and 18 acres each.

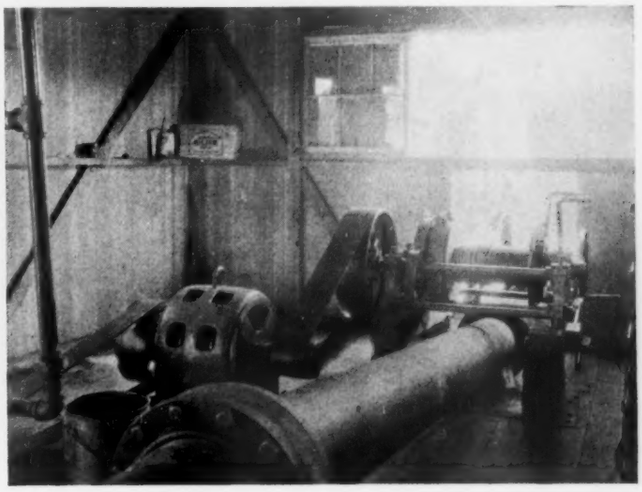
After visiting several sand and gravel plants and studying the industry and their particular problems, it was decided that the best method of working the deposit was by dredging. This because the water line is only 2 ft. below the surface, normally, and also because the material runs more than 60% sand and less than 5% of the gravel is over 2¾ in.

A wooden-hull dredge was built and launched in an adjacent pond and fitted complete with electrically operated equipment. This machinery consists of an 8-in. Hetherington and Berner pump, direct-connected to a 150-hp. variable-speed General Electric motor; a 24-in. diameter stone box, 48 in. long and a single-drum Domestic Engine and Pump Co. hoist, driven by a 10-hp. Burke motor, for handling the suction line boom. The boom is a 10-in. pole, 32 ft. long, and supports a 32-ft. suction line with a 9-ft. vertical length at the end of it. The suction end is fitted with only one cross-bar so that boulders no larger than 6 in. in diameter (they are very few) can be lifted.

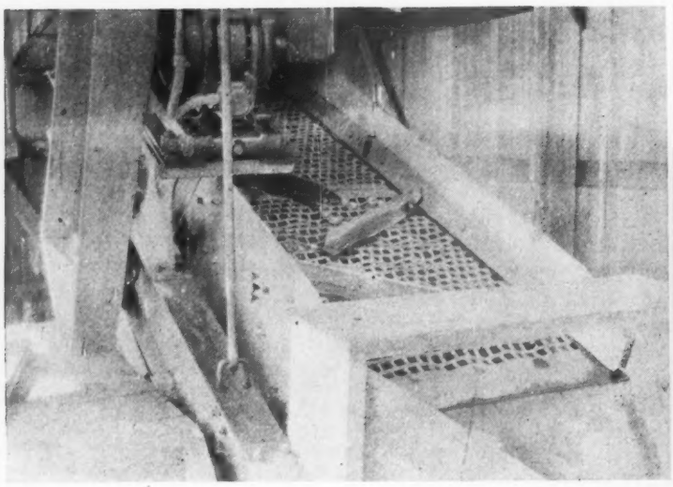
The 8-in. line from the dredge to the top of the plant is approximately 200 ft. long, having three bends, one of 45 deg., with a lift of 60 ft. The dredge sleeves are of the conventional type and, like the rest of the dredge's equipment, were furnished by Hetherington and Berner.

The plant itself is of unusually simple design. There's no "ginger bread" in it. The line discharges into a 3- by 12- by 5-ft. deep steel-lined spreader box, from which the material drops to a baffle plate and thence to a double-decked "Summit" vibrating screen (J. S. Morrison Co.). The top deck is fitted with a perforated plate with 2¾-in. openings; the lower deck has ¼-in. openings. The material retained on the lower





Inside the Batavia dredge showing pump and motor as well as hoist and line into the stone box

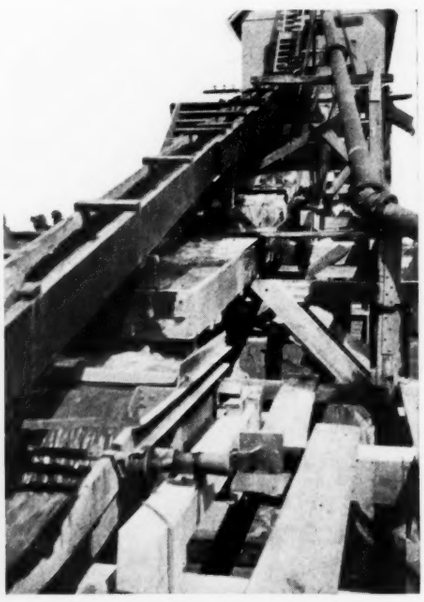


Left, the lower vibrating screen, and, right, storage pile with small shovel loading truck

Three of the Batavia company officials. Left to right, F. G. Feitshans, president and general manager, who has charges of sales; F. R. Miller, in charge of the plant, and G. T. Walker, who supervises the operation of the dredge

deck flows to a triple-decked screen of the same kind as the upper one. This screen's top deck has 1½-in. openings and the center deck has ¾-in. openings. The top half of the lower deck has ¼-in. holes and the bottom half has 7/16-in. perforations. In this way are produced four sizes of gravel: 1½ to 2¾ in., ¾ to 1½ in., 7/16 to ¾ in. and ¼ to 7/16 in.; or, sizes Nos. 3, 2, 1 and 1-A, according to the New York state highway standards.

The sand from the upper screen is flumed into a wooden tank of the usual water storage type, 10 ft. in diameter and 8 ft. high, fitted with a locally-designed control gate. A flume mounted about 20 in. from the top of it carries away the silt, surplus water and fines. From the tank the sand feeds to another trough leading from the lower vibrating screen to the first settling tank. There are three settling tanks, two in tandem, all of the same size, furnished by the Stephens-Adamson Manufacturing Co. They are 4½ ft. square and 5 ft. deep. The first two produce concrete sand and the last one mason's sand.



In the immediate foreground is the fine sand-settling tank

The dredge as seen from the top of the plant

So far, the only provision for storage is on the ground under and around the structure of the plant. However, two 20-yd. capacity steel bins were being erected at the time of my visit. These will be used for gravel and will be filled direct from chutes from the screens. Sand and gravel are reclaimed and loaded into trucks by a Universal Power shovel with a ⅓-yd. dipper. This outfit is rented by the company.

Eventually, it expects to put in a ½-yd., or larger, shovel or crane.

The plant is laid out so that a belt conveyor can later be installed to run under the plant, out and over to the siding for direct loading of railroad cars. At present no provision is made for rail loading. This is because the local demand for truck shipments this year consumes the plant's entire maximum output, which is 600 yd. per 10-hr. day. Plans for the future are installation of truck scales and also a truck batcher tank.

This interesting little plant was designed and built in 60 days' time.

Lime and Limestone for Neutralizing Water from Coal Mines Is Favored

NEUTRALIZATION of acid mine waters which drain into rivers and creeks, and constitute a serious sanitary problem, can be accomplished so far as chemical and mechanical factors are concerned, the Bureau of Mines of the Department of Commerce has said recently. The problem of neutralization is one of economics, the Bureau declares.

Because the problem is economic rather than chemical or mechanical, it must be considered separately for specific sections or communities, for the factors involved are of such nature that one hard and fast rule cannot be applied with equal satisfaction to all cases, says the Bureau. The statement follows in full text:

The pollution of streams has received much attention during the last few years, and although there are many more serious forms of pollution, the problem of acid mine drainage is important in certain sections of the country, particularly in Pennsylvania.

At the request of the Public Health Service, the Bureau of Mines undertook to determine some of the factors contributing to formation of acid mine water, the yearly variations in quantity and quality of drainage, effect of mining methods, and various other questions arising in connection with the problem. Some attention was also given to its economic phases.

A stream having a number of mines draining into it was selected for observation in both high-sulphur and low-sulphur bituminous-coal districts. These mines and streams were visited in both wet and dry seasons to note the quantity and variations in acidity of mine drainage and the subsequent effect on streams.

Most of the mines draining into these streams are drift mines. The streams were sampled at regular intervals of about one-half mile, unless entering streams or unusual conditions warranted more frequent samples.

Mine Samples Vary Widely in Acidity

Mine samples showed wide variations in acidity, but consistently indicated that drippers and samples from fresh working faces were with one exception almost invariably alkaline or faintly acid because of the presence of bicarbonate or dissolved carbon dioxide in the water. On the other hand, water from inactive or abandoned sections was almost invariably acid to a degree determined largely by the period that the sections had been idle.

Gobbed material, both inside and outside the mines, is undoubtedly an important source of acid water; but whether the practice is to gob rock and high-sulphur coal inside or outside the mine, the general acidity of the water from the different mines does not show appreciable differences.

Outside gob piles are under the most favorable conditions for liberating acid, more so than if the gob material were inside; therefore it seems that less damage would be done if the acid-forming wastes were left inside. If gob material could be placed in dry sections of the mine and sealed off to exclude air, the minimum formation of acid might be expected.

Water from the mines having a limestone floor would be expected either not to be acid or at least to be less so than water from mines in the same district not having a limestone floor. No marked difference has so far been observed in such waters, probably because after a short time the drainage channels become coated with iron oxide which adheres tenaciously to the stone and protect it from contact with the water. Water from high-sulphur-bearing coal beds is more acid than that from low-sulphur beds.

Abandoned workings are known to have given off water of approximately the same quality and quantity up to at least 15 years after being abandoned. One abandoned mine has been giving off highly acid water for 45 years to date; no caving has yet occurred in this mine. Four others exhibit the same characteristic after having been abandoned 35 years. Twenty-five abandoned workings showed about the same acidity as eight active mines in one district studied, but in the other district seven abandoned mines showed only about one-half the acidity of the other 17 active mines.

Seasonal variations play an important part in the effect of mine drainage on streams. The maximum stream volume at flood stage in such localities as those studied may be many times the average volume because of the rapid run-off. Heavy rains of short duration, therefore, dilute the water to the extent that it may be considered harmless; mine drainage is not increased unless slower soaking rains occur. On the other hand, at periods of low water, usually in August or early September, the stream volume may be almost entirely mine drainage.

So far little opportunity has been afforded for observing the effect of a definite quantity of acid streams. With one exception, the entry of drainage from successive mines resulted in building up an acidity which decreased only slightly until the stream entered a small river.

At present there seems to be no solution of the problem of stream pollution other than that of chemical neutralization. Two general methods might be used to treat large volumes of water; one is to feed ground limestone or lime to the raw water, using a baffled flume to mix the lime well, and then permitting the water to flow into natural or artificial settling basins of sufficient capacity to retain the water for four or five hours. During this time the hydrated oxides of iron will settle out and the effluent water will be neutral or alkaline, somewhat harder, but almost clear, and harmless for most purposes if the treatment is carefully controlled.

Of the methods now in use this is the cheapest in first cost and the most simple in operation, but leaves the sludge as a material too thin to shovel and too thick to pump. Its subsequent removal and disposal is likely to prove as much of a problem as the original acid neutralization.

Company Develops Practical Process

One company has used a process which at least results in an oxide of a form easily handled. After being mixed the water travels through a thickener to a settling tank, and is finally sprayed on a revolving iron drum heated sufficiently to dry the film of oxide sprayed on it in less than one revolution; this is scraped off at the end as a dry yellow powder.

With the exception of some of the larger companies with ample finances or of others whose mines have only slightly acid or alkaline waters that are easily treated or are unnecessary to treat, individual installations of the type just described would prove such a financial burden as to force a great many mines to cease production, unless the additional cost could in some way be distributed over the coal industry as a whole.

The solution of the problem of drainage disposal after coal areas have been mined out and acid water still continues to flow for an indefinite time is also uncertain. One possible solution is to seal abandoned mines so as to exclude the air and thus prevent further oxidation of the pyrite. It seems likely that water from such mines would become pure again in less time than if they were not sealed.

Considerable improvement in certain sections that are now being polluted by water from abandoned workings might be accomplished by sealing the mines; the cost would not be great and the process does not appear difficult in most cases. The success of this scheme seems very probable because it has repeatedly been shown that where abandoned mines are sealed either by natural caving or by building seals, the water is suitable for all ordinary uses, sometimes even for drinking water.

Further information is given in Serial 2889, "Observations on Acid Mine Drainage in Western Pennsylvania," by A. D. Leitch, associate chemical engineer, copies of which may be obtained from the Bureau of Mines.

Standardization vs. Discrimination

A Reply to the Editorial Comment on My Article in Rock Products of August 16 on "Premium Aggregates"

By Stanley M. Hands, C.E.
Assoc. M. A. S. C. E., Junior Testing Engineer, Division of Highways, State of California

A MAN WITH A THEORY is rarely a good advisor unless he regards his theory with suspicion, as contrary to existing assumptions of fact, and therefore an enemy to be destroyed if possible. And destruction will follow if the theory cannot be proved. The danger lies in the amount of influence which the theory may have before it is destroyed.

"Be not the first by whom the new is tried,
nor yet the last to lay the old aside."

The factors that enter into the measurement of quantity and quality are authority, adaptability and stability. When these are adaptable to being measured and giving measure, they will, by general consent, become standards or definitions. Therefore standards are those things which are set up and established by authority as a rule for measuring. The practicability of a standard is determined by the implication that it has been universally tested. The criterion of value is this confidence in its final test. Therefore any measure of an assemblage of all facts might by general consent become a standard.

Standards or Fundamentals

If it is desirable that practices within the mineral aggregates industry be standardized, it is first necessary to determine which things can be set up or implied as measurable, and by a majority consent. The nature of the materials, the methods of manipulation in making and using, and the product in which they are essential ingredients, must all be subject to measurement, as this is the basic requirement of standardization. If it can be established that there are rules or measures whereby all pertinent factors can be defined or measured, it is apparent that an important step would be taken if these definitions and measures were adopted by the industry concerned therewith. The habit of each member speaking the same language and using the same descriptive expression to like things would clear up certain vague ideas which each has as to the other's preferences. In this way certain confidences would develop to encourage the setting up or establishing by authority those factors concerning which there is little or no conflict. When factors are beyond doubt or dispute they can be classified as principles, if not standards. Some of this has been done even to the extent of setting forth the business relations of members of trade associations, as is being done by the Federal Trade Commission.

Each member owes to his industry the assurance that business will be continued according to some rules or standards, but all of these rules and standards cannot remain always the same, if the individual is to be relatively free and unhampered in his efforts. There is a threefold obligation between members and industry, each to the other, which must be recognized, but this need not create any great conflict. In the speculative excitement of securing orders an individual may sometimes disregard the constructive character of certain ethical standards, but such cases can eventually be the exception rather than the rule. There is little tendency to do harmful things if contacts with each other are maintained often by competitors. If conflicts do occur they should be considered carefully to determine if there are developments which need adjustment. These adjustments of relations must be encouraged and made to meet the changes which develop as experience proves the practicality of various applied theories of production and selling. The ultimate success of organized industry will depend upon its ability to adjust the old or develop new methods and standards to meet changing conditions.

Editor's Note

A RATHER INVOLVED argument that there is distinction between fundamental laws of science and "standards": That concrete aggregates should be made and sold on the basis of their fitness and value to the fundamentals of concrete design rather than to artificial standards or specifications; that the encouragement of this kind of discrimination in the use of aggregates permits a wide range of proportions, grading and other characteristics, and hence is helpful to the producer.

Whenever "standard" methods of production, sales or consumption are employed too long, business ceases to flourish. Quick minds grow slow. Inventive minds go stale. Old standards and routine slow down the pace of every man who carries responsibility. If organized industry expects to progress and keep alive, it must, in addition to measuring the value of routine standards, produce and develop new ideas and plans to replace and replenish those which become holdbacks or are obsolete.

It is not our purpose to consider processing or selling except as they may have some bearing upon the determination of standards. In this respect consider the matter of waste. "Whether you order it or not, you pay for it."* This fact is well understood, and recognition in many cases has resulted in wastes becoming secondary and even primary products. Such things are desirable, but they could not have been accomplished if someone had not disregarded old practices and standards. Buildings, machinery and labor cost something. If anything involving such a layout cannot be converted into cash or its equivalent, there is a loss. Otherwise that part which can be converted must absorb this loss. This too is readily understood, but sometimes it is far more difficult to recognize the things that make for waste, because waste may have to do with other things than those immediately under the control of the operator or producer. This is the case with concrete aggregates.

Limitation of Aggregate Standards

The practice of proportioning concrete mixtures on a basis of definite grouping of a limited range of sizes may be standard or accepted practice. From the viewpoint of the engineer it is entirely logical and economical. The simplicity of the method appeals to him, for it relieves him of much detail. Since prevailing prices and quantities indicate a satisfactory cost of concrete, the engineer is not much concerned about losses involved in furnishing those materials. He assumes that if there were any losses they were the fault of the man who sold. The fact that other methods of grading and fundamentals of proportioning would have produced concrete of the same quality is not important to the engineer under those conditions of price and practice.

If, however, that same engineer had been charged with the responsibility of making concrete of even quality and price throughout a large territory in which there was but a limited supply of materials as previously used, he would be forced by these new conditions to acknowledge the undesirability of his previously accepted standard gradings

*American Appraisal Co., *Nation's Business*, August, 1930.

and proportions. He would adopt a new method of utilization of materials entirely unlike the previous standards except as to certain measurable fundamentals pertaining to the design of concrete mixtures. These similar factors are not, however, the so-called standards, but are natural laws covering the use of aggregates for making concrete.

Distinction Between Natural Laws and Standards

The distinction should be made between these natural laws and standards. The first operate without modification to produce certain results, the desirability of which is dependent upon what precautions have been taken to permit their operation. The second is a matter of agreement, depending on such evidence or data as are available to establish a choice. If the engineer is responsible for making the aggregates, which is sometimes the case on public works, he may and generally will find that his pet proportions and grading are causing an undue amount of waste. He finds that certain sizes which he wanted are not present in sufficient quantity to be obtained without wasting a large amount of those sizes of which there is a considerable surplus. As the costs of processing and wasting become factors, and capacity drops off, the engineer realizes that the most economical proportions are a matter of something besides cement. The matter of grading and proportions becomes of concern from an entirely different viewpoint than as previously stated. The engineer's remedy is to discard his old standards and fall back upon the fundamentals of the design of concrete mixtures. The discrimination which is encouraged by designing to fit the aggregates is in this case favorable to the use of more nearly the run-of-the-pit. This case was not a matter of standards but a matter of applying a fundamental law.

Educational leaders have always recognized the impracticableness of so-called practical experience as part of school training. By the time the student has finished school, practice has changed and he is not much better off than if he had not had any training. The schools teach fundamentals. The dependence is placed upon the student that he will recognize their application in his contacts after his school days are past and he enters business. Devices may change in their application, but fundamentals never change. A device may be developed to include additional fundamentals or it may become obsolete in its application, but the fundamental from which the device was conceived is transported in effect to be used in the same manner to produce the same result under some other conditions.

Oxygen is necessary for burning and is fundamental in combustion, but there are any number of devices to bring it in contact with fuel. The amount of air required depends upon the fuel. The rate at which heat may be generated depends upon the rate of application of the air. All of these things are natural laws, not standards. The unit of heat may be standardized, as also may the device to utilize the heat—that is, the boiler. The boiler, however, did not make the heat. It utilized the heat generated by the joining of the fuel and the oxygen. The teacher, therefore, does not reject fundamentals, for they are the basis of our sciences and arts. They may have to extend their facilities to provide for consideration and teaching of new fundamentals or conceptions, but these extensions should not obscure the fact that the immutableness of established fundamentals permits of a standardized system of teaching. All other conditions or apparent facts must, in the absence of authoritative confirmation, have this characteristic, that it is a fixed truth and is measurable or definable before it can be standardized.

Standards Must Be Changeable

Standards can be changed, but fundamental and natural laws do not change. It is fundamental that we need standards, but just what those standards should be is another matter. The aggregate industry should be mindful of the future in this respect, that the application of fundamentals may make it undesirable that some things be standardized. The young man who is now receiving his fundamental training will quickly be of the "ins." His very human tendency will be to challenge the old and, gladly or ignorantly (take your choice), accept the responsibility (and all credit) for a change in concrete practice. New hopes and improved prospects are hard to compromise. These new men may be ignorant or courageous, and may be a nuisance, but they will contribute their share towards progress.

We cannot but think well of the old Iowa blacksmith. He regarded the wreck of his first and only attempt at flying for a short time and remarked, "The trouble is that all the theory ain't there." That is the trouble with our attempts at standardization. We cannot disregard precedent, but we should not assume that we have reached the ultimate. Additional utility of aggregates may develop discrimination, but it offers a field for stabilizing marketing, if judiciously handled.

Some of the most experienced practitioners think that the concrete art is slowly working in the direction of discrimination in the use of materials. As a matter of fact most of the fundamentals are ready. Only the co-operation of the producer is needed. Time, of course, is on the side of discrimination, for inasmuch as equipments are now available to make, measure and use materials, the engineer has been able to demonstrate the practicality of many of his theories. New applications are becoming quite numerous, and with each successful completion of a job the influence of these is becoming more real than is at first apparent. The accumulations of experience and data in these explorative individual applications of common theory will some day be reflected in plans and specifications to meet which the individual producer will not be prepared without the assistance of organized industry.

Certain Properties of Aggregate That Differ

Certain aggregates have the property of preferential adsorption, which may or may not be desirable, depending upon the nature of the cementing medium. In considering this phenomenon a very clear distinction must be made between coherence, absorption and adsorption; adsorption carrying with it the implication of natural forced concentration of liquids upon the surface of the aggregates. This property of aggregates has its application particularly in the construction of pavements using petroleum cements. Some recent developments in the study of this factor suggest the idea that the success of certain patented pavements depends much more upon the introduction into the mix of some desirable adsorptive materials than upon the basis of the patents. Observations on roads in the Middle West upon which an oil surface treatment was placed after treatment with hydrated lime confirm the opinion that this type of construction is worthy of further consideration for certain regions. Crushed limestone or hydrated lime filler has always been considered as necessary to asphaltic mixes.

Contrasted to these cases we have ample evidence that treating certain local materials with oils or asphaltic cements has not resulted in good surfaces. The preferential attraction for water as against asphaltic cements shown by some materials makes these materials undesirable for this type of construction. During the rainy seasons the aggregates pick up the water and release the cementing medium to be dissipated by washing or by traffic.

Before the adoption of screening plants concrete was often made from pit-run or crusher-run materials. Time developed grading to economize on cement. The utility of closely graded materials was so great that on a basis of existing prices for aggregates, regardless of character, it became obviously useless to argue for sameness in price. The better graded aggregates came into demand even at a higher price. Production then was limited to small markets, and mass production to lower the cost of production was out of the question. However, all aggregates having the proper structural soundness could have been used so far as quality of concrete is concerned. The utility was a matter of degree as regards the manner of its use. The value of the material therefore became more or less dependent upon its usefulness as a tool or a device used as an adjunct to a more important item—the cost of the finished product in which it was an ingredient. The utility of aggregates is not, then, to be considered alone from the standpoint of what they will make, but how they will make what is intended. The measure of their utility lies in the profitableness of their use.

To adjudicate this difference in utility does not mean to condemn a material on a basis of a particular case. It does not follow that because the price of a certain type of material was high on one job that that same price and type of material on another job would not be more economical. Other factors may determine this. Aggregates are essentially a part of all cemented mixtures and for different reasons. It is these reasons that offer a basis for preferential buying, based upon discrimination in use.

The surface property of an aggregate is a factor in its use under certain conditions. This factor takes on multiple possibilities in its origin and effect. It is generally known that surfaces that are exposed in nature may become coated with a gelatinous covering which is often transparent and is not detected even with the microscope. Material which may qualify for use under grading and sizing standards may be found to be undesirable for lack of bonding quality.

Discrimination by the Producer and Seller

Since all of these inherent properties of materials are important to varying degrees, depending upon the nature of the use of the material, it is evident that, as measures are provided, there will be discrimination between materials both as to their use and as to the manner of their use. Those things that are fundamental can form the basis for standards, but only in the field in which they have desirable application. Sizes can be standardized, and this is desirable from the standpoint of the technician and the producer. However, it will be to the advantage of the producer to encourage certain forms of discrimination in the use of materials in order that market demands can be balanced against the run of the mill. So far as portland cement concrete is concerned good concrete can be made from aggregates showing a wide range of proportions, grading and other characteristics. This is a fundamental to be exploited.

If salesmen will sell on a basis of fundamental technology the fact that a competitor elects to produce and sell a material which necessitates different applications to give the same result cannot provide grounds for any truthful disparaging remarks.

Research has not been adequate to determine and measure all of the conditions and properties which make for these differences in material. Recent advancement has been made which sets forth as distinct and unconfused, pertinent factors about aggregates and their effect upon cemented mixtures; but, it should not be assumed that the subject has been exhausted. Until adequate facts are known it would be undesirable for organized industry to set up or attempt to set up standards. If such a thing were to be accomplished it must be sure, or it may be destructive to organization because of the confusion which would follow the need for a change.

If there is anything in selective usage or discrimination as to methods of applying technology which is the antithesis of organized industry, or its essential supports, it is but temporarily so. All the aggregate associations are provided with exceptional research and executive organizations. I have not noted that they were ever far behind or far out of step. Since the use of aggregates appears to most of us to be multiplied and complex, it is very desirable that these organizations be maintained. It is this multiplicity and complexity and not standardization which necessitates the organizations.

Nonmetallic Mineral Exports Show an Increase

COMPARISON of figures for the first half of 1930 with the same period of 1928 indicates an increase in the value of nonmetallic mineral exports. Figures for 1928 were used in preference to those for 1929 because the latter was an abnormally prosperous year. According to Joseph Ulmer, Minerals Division, Department of Commerce, manufacturers of nonmetallic raw materials have made, and are making, notable strides in an effort to increase their sales in all quarters of the world. Not content with the rapid adoption of their materials in domestic-construction work, making mandatory the meeting of rigid requirements of speed of construction, standardization, efficiency and improved technique, they are, through aggressive yet careful marketing, not only meeting foreign competition but in many cases, by reason of quality, innovation and sales argument, are supplanting it. It seems reasonable to believe, therefore, that the foundations now established will result in proportionately greater sales.

Of unusual and particular interest has been the successful advance made by such manufacturing industries as use asbestos, clay and gypsum as bases. In the case of the first, much of the raw material involved is imported and subject to a rail haul which, because of source of supplies, cannot be greatly reduced. Further, asbestos products are subject to labor and other charges commensurate with a high standard of living, which seriously and definitely affect the sales price of finished goods.

The same situation may be said to apply to the other two classes of products mentioned; in addition, many exported items are manufactured in the central states and subject to relatively higher rail charges. That they are marketed successfully throughout the world in competition with much more cheaply produced similar items of commerce seemingly, increases have been along the line of semi-finished or finished goods. Building materials, consisting of building stone, wallboard of various types, tiles and furnace requisites, made up of refractories, have predominated in the advance despite numerous factors normally regarded as obstacles militating against selling in export trade.

On the other hand a notable decrease occurred in the imports of nonmetallic minerals during the first half of this year. In quantity and value receipts were lower than they have been during the last five years.

Mica Production for 1929

THE TOTAL QUANTITY of uncut mica sold by producers in the United States in 1929 was 7270 short tons, valued at $404,122, as reported by the United States Bureau of Mines, Department of Commerce. Of this quantity 1017 tons (2,034,928 lb.), valued at $286,221, was sheet mica, representing 1,731,096 lb. of punch mica, valued at $97,344; 282,884 lb. of mica larger than punch, valued at $187,232, and 20,948 lb. of uncut splittings, valued at $1645. There were 6253 tons of "mine" scrap mica sold in 1929, valued at $117,901.

The sales were made by 10 states, the same as in 1928: Alabama, Colorado, Connecticut, Georgia, Maine, New Hampshire, New Mexico, North Carolina, South Dakota and Virginia. Figures for Alabama, Georgia, North Carolina, South Dakota and Virginia were collected in co-operation with the state surveys.

The total sales of ground mica in 1929 were 3,637,192 lb. (dry ground), valued at $62,769, and 5,395,005 lb. (wet ground), valued at $298,731.

The consumption of mica in the United States depends largely on the available quantity of foreign mica, the imports of which for consumption in 1929 were 6,475,665 lb., valued at $2,223,408, compared with 4,104,975 lb., valued at $1,426,495 in 1928.

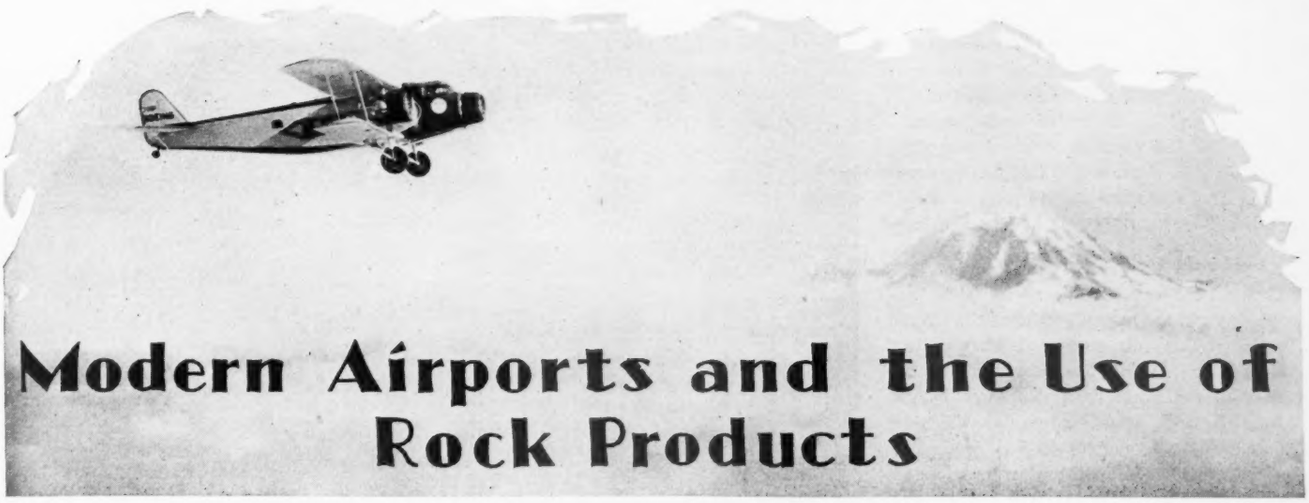
EXPORT TRADE IN NONMETALLIC MINERALS DURING FIRST HALF OF 1928 AND 1930

Item and unit	Quantity 1928	Quantity 1930	Value 1928	Value 1930	Adjusted value* 1928	Adjusted value* 1930
Sand and gravel, tons	226,744	127,697	269,310	295,419	287,417	326,430
Cement, hydraulic, bbl.†	385,596	461,136	1,335,414	1,490,855	1,425,203	1,647,354
Lime, bbl.‡	85,902	77,752	112,678	113,910	120,254	125,867
Building bricks and hollow tiles, M	3,600	6,309	89,522	172,462	95,541	190,566
Wall and floor tiles, sq. ft.	661,281	848,543	129,314	336,609	138,009	371,944
Chalk manufactures, lb.	838,195	594,708	106,814	76,586	113,996	84,625
Gypsum:						
Crude, crushed or ground, tons	1,507	2,350	16,513	16,929	17,623	18,706
Plaster board, wall board, sq. ft.	7,789,233	9,929,249	206,830	254,662	220,736	281,394
Plaster, calcined and manufactures, n. e. s., lb.	12,103,128	21,303,697	151,593	220,936	161,785	244,128
Mica and manufactures, lb.	1,301,890	2,295,292	111,569	124,459	119,070	137,524
Magnesia and manufactures, lb.	2,963,484	3,599,324	161,097	243,261	171,928	268,797
Graphite and manufactures, except crucibles, lb.	2,025,419	1,795,350	193,165	247,779	206,153	273,789

*Adjusted according to United States Department of Labor average wholesale commodity index prices for periods covered.

†Barrel=376 lb.

‡Barrel=200 lb.



Modern Airports and the Use of Rock Products

By Robert E. Johnson
Boeing Airplane Co., Seattle, Wash.

WITH THE OVERNIGHT POPULARIZATION of flying in 1927, when Lindbergh spanned the Atlantic ocean, aviation stepped from the position of an unstable novelty into the ranks of America's important industries. Buoyed up by a tidal wave of public interest, the nation's war-time airplane factories, which had found that there were but few markets for their products after the signing of the armistice, swung into the full stride of production to lead the swift march of commercial aviation's progress in the United States.

Today, America's airways are well traveled by planes carrying a great volume of passenger, mail and express traffic, and air commerce assumes increasing importance as the airplane becomes identified as an integral unit in the national system of transportation and communication. During the year of 1929 a total of 200,000,000 miles was flown by planes in the United States, and three-fourths of this mileage was recorded by civil aircraft.

Air Terminal Facilities

One of the outstanding developments in commercial aviation has been the provision made for adequate air terminal facilities to accommodate the steadily growing travel by air. Cities found that the airport could no longer be regarded as a novel amusement, but that it was becoming a commercial necessity. Air mail and air passenger routes were being rapidly extended, but their effective expansion depended upon the establishment of airport facilities. This expedited the active and constructive progress in this field of aviation, with the result that during the past year millions of dollars have been spent by progressive communities and private companies on the construction of adequate air terminals.

To insure intelligent and permanent development of airports throughout the United States, the Aeronautics Branch of the Department of Commerce, which supervises civil aviation in this country, has formulated a set of basic requirements and rating and grading systems to regulate airport construction. These requirements specify how the airport should be constructed and equipped for satisfactory operations.

The part being played by rock products in the modern airport development becomes apparent in the reference made to the construction of the runways in the Department of Commerce specifications. The runways, of course, comprise one of the most important features of the airport.

The average hangar floor as well as warming-up area in the foreground are built of concrete. This one is at the Oakland, Calif. port, where crushed rock and a binder are used for the surfacing of the runways

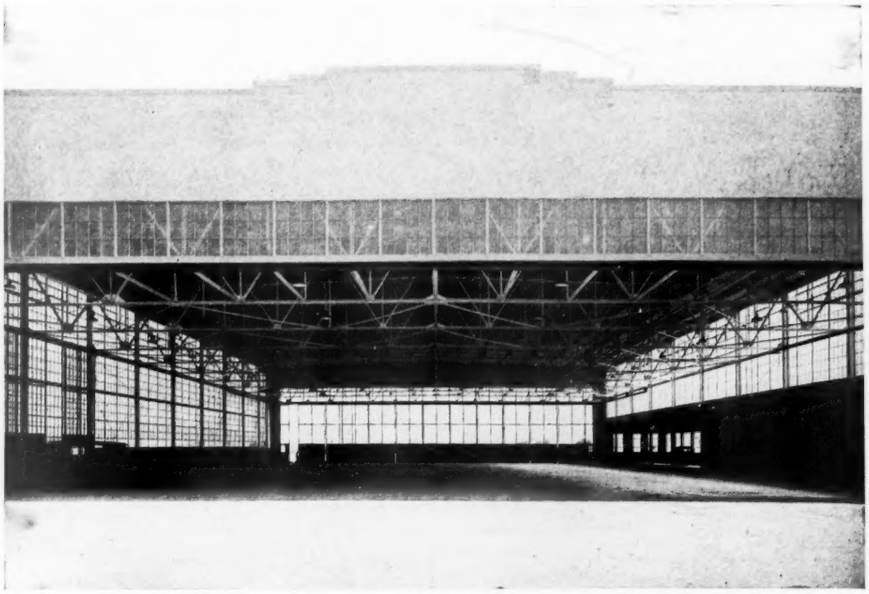
Runways

"Runways shall be constructed of some wear-resisting material," says the Department of Commerce bulletin, "such as crushed stone, crushed slag or other suitable material, in such manner as to give a smooth, firm, uniform surface. This includes such types of construction as bituminous macadam, bituminous concrete, portland cement concrete, etc. Runways shall be so designed and constructed as to withstand safely the loads to which they will

ordinarily be subjected. They shall permit safe landing and taking off under ordinary weather conditions and shall be not less than 100 ft. in width. The edges of the runways shall be flush with the adjacent surfaces of the field, and shoulders of some material such as crushed stone or crushed slag shall be provided to insure the safe landing and taxiing of planes across the runways in any direction."

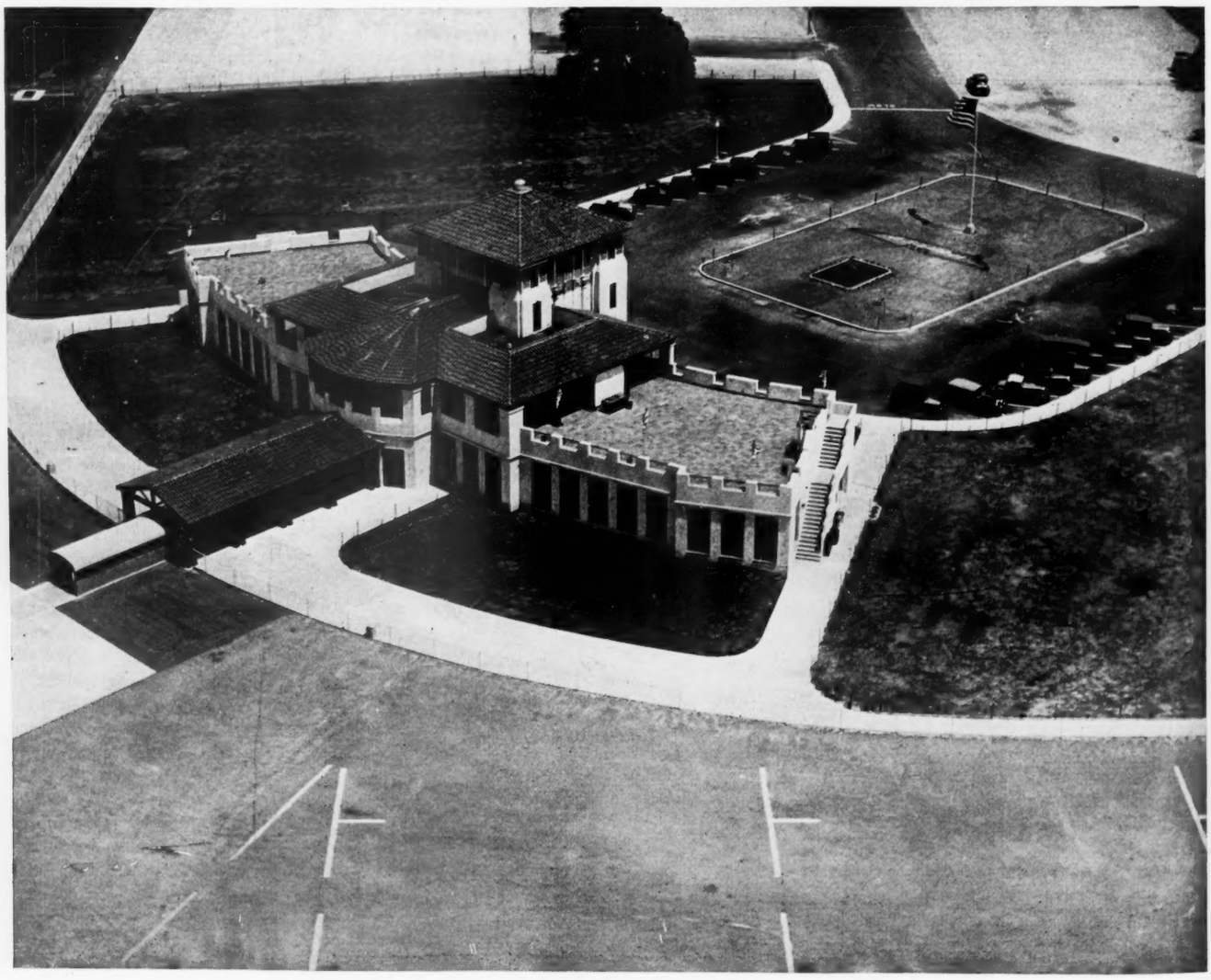
Burbank, Calif., Airport a Model

One of the outstanding air terminal developments in the nation is that of the United Airport at Burbank, on the outskirts of Los Angeles, Calif. This was developed for the United Aircraft and Transport Corp. by the Boeing System, operator of the Chicago-Oakland-San Francisco and Seattle-Los Angeles-San Diego mail-passenger airlines. The air terminal is a 243-acre project developed at an initial cost of $1,500,000 for an A-1A rating, the highest awarded by the Department of Commerce. Concrete, crushed rock, asphaltic oil and sand mixtures and other rock products played an important role in the development of this outstanding air terminal, a really remarkable project.



Hangar used by the Boeing System, Pacific Air Transport, at the United Airport, Los Angeles, where floor and warming-up area are of concrete

The six-way runway system provides for an east-west runway, 3600 ft. in length; a north-south runway, 3000 ft., and a northwest-southeast runway, 3600 ft. The present



Terminal building at United Airport on the outskirts of Los Angeles

width of the runways is 300 ft., with provision for an increase to 500 ft. in width.

For the construction of the runways an asphaltic oil and sand mixture was employed, built up in two courses, each 2½ in. thick. The base of the runways was first prepared by mixing refined road oil with the native soil. This base was then dragged and rolled until compact, after which was made the application of the hot-plant mixture of scientifically graded sand aggregate and 6 to 7% asphaltum.

More than 2000 lin. ft. of area 150 ft. wide has been constructed of asphaltic concrete pavement construction to allow for airplane parking away from the runways.

In front of each hangar door is a warming-up apron 150 ft. square, of portland cement concrete construction.

Paved Runways Necessary

Many modern airports throughout the nation are being constructed with hard-surfaced runways, of concrete, asphalt-sand mix and other types of surfacing. Commander Richard Byrd once said that the effective airport should be surfaced with concrete or some other material unaffected by water. In general, airport surfacing is conducted along one of the following lines of construction: Portland cement concrete, bituminous concrete, bituminous macadam, or a type of construction employing gravel, crushed stone, crushed slag or sand, each used with a suitable binder.

At the municipal airport at Oakland, which is the western terminal of Boeing System's transcontinental mail-passenger airway and the operating headquarters for the Boeing Pacific coast route, portions of the field have been built up of crushed rock, rolled and bound with asphaltic oil, while other areas have been constructed of asphalt and crushed rock. Crushed stone runways were employed at the Dayton municipal airport.

The most extensive development utilizing concrete runways is the Ford airport at Dearborn, Mich. A runway 75 ft. in width and 2653 ft. long has been constructed almost entirely of concrete. In addition, there is also a wide concrete apron in front of the hangars. The pavement was one-course concrete, 7 in. in thickness.

The concrete runway which has seen the longest service is that of an airport located at Milan, Italy. Built 13 years ago, the runway is 230 ft. in width and is sufficiently long to provide adequate landing area for any type of modern airplane.

Concrete for Station Buildings and Hangars

The use of rock products in airport development is by no means confined to runway surfacing. A great amount of concrete was used in the construction of the United Airport, for example. The Austin Co. engineers, co-operating with Boeing System engineers, specified that the foundations and basement walls of the station building be built of concrete. The ground floor of the large passenger and traffic headquarters was constructed of concrete mixed in the same proportions as the foundations, poured monolithically and with a smooth trowelled finish.

The open and closed decks on the second floor of the building, from which passengers and spectators watched the airport activities, were built up of concrete similar to that used on the ground floor, topped with a mixture of one part portland cement and two parts of sand.

Considerable attention was paid by Austin and Boeing officials in the erection of the all-

An aerial view of the Los Angeles terminal showing the great runway areas which are surfaced with plastic oil and sand mixture. The hangar and terminal building are of concrete, stone and steel construction

important hangars in which the planes were to be housed. Foundations are of concrete. The ground floors are 5-in. concrete mixed in the same proportions as the foundations, poured monolithically and with a smooth trowelled finish.

Exterior hangar walls were built up of standard concrete "stone-tile," acid-stained in different colors.

Three hangars have been erected at the present time, and space is reserved for further hangar construction. They are of uniform masonry and steel construction.

The terminal building, of Spanish design, is in plan a three-story reinforced-concrete tower, 200 ft. by 60 ft. over all, with extensions planned to meet future requirements.

At the present stage of development, more than a year after the airport project was initially begun, it is ranked as one of the nation's outstanding air terminals, and will be one of the world's finest when expansion plans are consummated.

One Company's Developments

The Boeing System, with its extensive transcontinental and Pacific coast operations on its two routes over which it has flown 10,000,000 miles, has authorized the construction of six new hangar-depots along the Chicago-Oakland-San Francisco route in addition to its present ground terminal facilities. These structures will be of uniform construction, developed by the Austin Co.; $35,000 buildings will be erected at Elko, Rock Springs, North Platte, Iowa City and Reno, all of which will be completed this fall. A $60,000 structure will be built at Omaha.

Concrete Plays Important Part

In all of these buildings concrete will play an important part, in that the flooring of the hangars, as well as the spacious areas in front of the hangar doors, must be built up of concrete.

With the steady increase in air travel, the progressive communities of the nation are building and planning to construct durable and adequate airports, and rock products will see increasing use in this field during the next few years.

Changing Trends in Building

"THE VOLUME OF BUILDING CONSTRUCTION has always exercised an important influence on the general business cycle in this country and the question is frequently asked as to where one may look for signs of a recovery in this basic industry," says the September bulletin of the National City Bank of New York, which continues: "Mortgage money has become cheap and plentiful during the past several months; material costs are somewhat lower, and real estate authorities have urged that the present is an opportune time to build. On the other hand, there is still reported a surplus of space in many localities, including office buildings, factories and high-priced apartments, the demand for which is slack because of depressed business conditions. Public utility and engineering projects are proceeding in large volume, partly as a result of the efforts of business leaders to push this class of work so as to relieve unemployment, but where they have involved a further increase in the steadily rising tax burden the reaction of taxpayers has not been altogether favorable.

"Meanwhile the total current expenditure for all classes of building continues to sag, and the contract awards from January 1 to August 1, 1930, amounting to $3,005,542,000, compared with $3,667,983,000 in the corresponding period of 1929, $4,028,300,000 in 1928, the peak in recent years, and are the lowest since 1924. These figures, compiled by the F. W. Dodge Corp., cover the 37 states east of the Rocky Mountains and represent more than 90% of the building for the country as a whole. Cumulative totals for the first seven months have run 18% behind last year, but there has been a striking change in their three component parts, residential building being 48% behind and non-residential only 13% behind, while public works and utilities are 20% ahead, a considerable portion of the gain being due to highway construction and pipe lines.

Rebuilding Cities to Go On

"It is quite possible that present conditions in the building industry, such as cheap money, etc., offset by the reported surplus of space, which is a temporary condition and is likely to be over-emphasized when a survey is made in a time of business depression, are not the only determining factors in the outlook for new building and that the key to the future is to be found in the changing trends in mode of living. During the past ten years there has been a marked growth in the larger cities, the census of 1930 showing 93 having a population in excess of 100,000, while in 1920 there were but 68. This group now makes up 36,000,000 people, or more than one-fourth of the entire country. Whereas the population of the country as a whole increased in the decade by 16.1%, no less than 47 cities now in the 100,000 class increased at a more rapid rate than this average figure. Of the five leading cities, which together account for more than 15,000,000 people, New York and Chicago increased by approximately 24%, Philadelphia by 7%, Detroit by 57%, and Los Angeles by 113%.

"The continued growth of our large cities is making it necessary to rebuild them almost completely. Old office buildings located on space that has become immensely valuable are being replaced with modern structures that rise from 30 to more than 80 stories and accommodate several thousand workers. Tenement sections are giving way to towering apartment houses, hotels and even churches. Narrow streets are being widened so as to handle more traffic. The method of setting back the upper stories of tall buildings from the street was originally devised to solve the problem of air and sunlight, but has created a new type of American architecture.

Residential Building Farther From Cities

"As real estate values in cities have risen, they have forced the residential sections, except high-priced apartments, farther away from the business districts, and suburban development has been made feasible by automobile transportation as well as the extension of rapid transit and subway systems. Desirable home sites are no longer limited to those in close proximity to transportation lines, and it is now becoming an advantage to be situated some distance away from the main traveled highways.

"Large building projects within a city, as, for example, the New York Central building and the Chrysler building in the 42nd street section of New York City, have given stimulus to residential building throughout Westchester county from where it is convenient for workers to commute daily. This simultaneous rebuilding of New York City and the suburban development within a radius of more than 40 miles illustrates what may be expected to take place in every other large city during the years to come, and to furnish a huge demand for building labor and materials.

"Such growth of the larger cities is all the more remarkable when it is considered that there is a very definite counter-trend in the movement for 'decentralization' on the part of many concerns which have found that by moving their plants out into the smaller towns they could secure better working conditions and lower costs, although the executive offices are usually kept in the commercial and financial centers.

"New York City and the metropolitan area, which includes Long Island, Northern New Jersey and the Westchester County section, and comprises a population of approximately 11,000,000, or 9% of the country as a whole, had, according to the Dodge figures, contract awards during the first seven months of 1930 aggregating $576,000,000, or 19% of the total for the 37 eastern states. Its share of the total commercial building construction was 34%; of other non-residential building, 15%; of residential building, 22%, and of public works and utilities, 13%.

"Although the volume of residential and commercial building in a city is larger than that of public works, the latter is a valuable stabilizing factor, due to the longer time, in some instances ten years or more, required for completing the projects."

Researches on the Rotary Kiln in Cement Manufacture†

Part IV—The Laws of Output of Rotary Cement Kilns Calculated from Physical Data—Terminal Velocities Acquired by Hot Gases Flowing Through Rotary Kilns

By Geoffrey Martin

D.Sc. (London and Bristol), Ph.D., F.I.C., F.C.S., M. Inst. Chem. Eng., M. Inst. Struct. Eng., M. Soc. Pub. Analysts, F. Inst. Fuels; Chemical Engineer and Consultant; Former Director of Research of the British Portland Cement Research Association; Author of "Chemical Engineering"

A ROTARY KILN is a large conduit or pipe through which hot gas flows—first in an almost horizontal direction along the kiln, and then in a vertical direction up the chimney.

The force urging the gases into motion is the force of gravity. Gravity pulls downwards 1 cu. ft. of cold air outside the kiln with a greater force than it pulls downwards 1 cu. ft. of hot gas inside the kiln. In consequence of the hydrostatic pressure thus set up, the dense cold gas is pressed into the kiln so as to expel the hot gas inside up the chimney.

The case is analogous to a cork immersed in water. The cork is forced upwards owing to the fact that it is less dense than the water it displaces. That is, gravity pulls the cork downwards less strongly than it pulls downwards the surrounding water, so that the resulting hydrostatic pressure forces the cork upwards with a force equal to the difference in the weight of the cork and of an equal volume of water.

Now a cork rising upwards through the water from a great depth does not attain an infinite velocity. Its speed increases immediately after release, but the quicker it moves, the greater the resistance set up by the viscosity or internal friction of the surrounding liquid through which it moves, and very soon it attains what is known as a "terminal velocity," *i. e.*, the cork acquires a steady, uniform speed upwards.

Precisely the same thing appears to happen to the hot gases rushing through the kiln. As they move they encounter resistance, partly from the walls of the kiln, but mainly owing to the viscosity or internal friction of the gases themselves.

In each rotary kiln the temperature conditions (and therefore density conditions) are more or less the same when the same process of cement manufacture is worked.

So that nearly the same limiting speed or "terminal velocity" is attained by the gases issuing from the rotary kiln.

In the case of the ordinary rotary kiln employing the wet process (40% slurry) with an exit temperature of 800 deg. to 900 deg. F., the limiting speed of the gases escaping from the drying zone is usually about 16.1 ft. per sec.

Editor's Note

THE VELOCITY of the hot gases through the kiln determine the kiln capacity, hence an understanding of the laws of such gases is essential to the calculation of the capacity or dimensions of a kiln. Capacities of course vary with and without the presence of much water vapor in the wet and the dry processes of cement manufacture. Understanding and application of laws or formulas governing gas velocities permits checking kilns for efficiency and considering means to increase efficiency.

Percentage Fuel Consumption Is Independent of Kiln Size, But Depends Upon Kiln Shape

Another experimental fact which occurs in rotary kilns of the ordinary shape is this:

A large kiln consumes sensibly the same amount of fuel per 100 tons* of clinker as a small kiln of the same shape, using the same raw materials.

Kilns have been constructed ranging in size from 100 to 400 ft., and from 4 to 15 ft. internal diameter; it has been found that quite small kilns (using the wet process) consume from 27 to 34 tons* of coal (dry, 1 lb. = 12,600 B.t.u. per lb.) per 100 tons* of clinker, which is sensibly the fuel consumption of the large kilns.

This law is not at all obvious from theoretical considerations, because in general in engineering, the larger the unit the more economical it is to run. As regards fuel consumption, this rule does not hold in rotary kilns.

General Calculation of a Formula Connecting the Output of a Rotary Kiln with Its Diameter

From the two preceding experimental laws it is now possible to calculate the output of clinker from a rotary kiln of any size, provided that it is of the usual shape.

The calculation is carried out as follows:

Let V cu. ft. of exit gas at T deg. F. accompany the production of 1 lb. of clinker.

S ft. per sec. be the terminal speed of the exit gas issuing from the kiln.

d be the internal diameter of the kiln (brick to brick) in the calcining and drying zones, assuming that the kiln is of the same diameter in the calcining and drying zone. The bricks in this part of the kiln are sometimes 6 in. thick and sometimes 5 in. thick and sometimes are coated with slurry. So that d represents the diameter inside *the iron shell* of the kiln less the thickness of the bricks protecting the iron shell from the hot gases.

M be the output of the kiln in tons per hour.

Then

Volume of exit gas issuing from kiln is

$$\frac{\pi}{4}d^2S \text{ cu. ft. per sec.}$$

Weight of clinker corresponding to this amount of slurry is

$$\frac{\pi}{4}d^2S/V \text{ lb. per sec.,}$$

or
$$\frac{3600}{2240}\times\frac{\pi}{4}\frac{d^2S}{V} \text{ tons* per hour,}$$

or
$$M = 1.263\frac{S}{V}d^2 \text{ tons* per hour} \qquad (1)$$

Hence, knowing the value of the terminal speed S, the volume of gas V evolved per 1 lb. clinker made and the diameter d of the kiln, we can calculate the output of the kiln

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*Wherever tons are used in this article the British ton of 2240 lb. is meant. To convert to American net tons, multiply by 1.12.

under any conditions. So far as I am aware, this formula is new.

Application of Formula: Case I—Yields from the Wet Process Rotary Kiln

From an actual experimental determination I found that the composition of the exit gas issuing from a rotary kiln making ordinary portland cement out of a slurry containing 40% of moisture, with a fuel consumption of 33 tons* of standard coal per 100 tons* of cement, was

Carbon dioxide, CO_2	=	26.1 lb.
Nitrogen, N_2	=	47.7 lb.
Steam, H_2O	=	22.9 lb.
Excess air	=	3.3 lb.
		100.0 lb.

Also 1 lb. of clinker produced under these circumstances yielded 5.36 lb. of exit gas, which, at the exit temperature of 800 deg. F., occupied 181 cu. ft. The terminal velocity S of the exit gas was 16.1 ft./sec. This may be regarded as good average practice.

Here $V = 181$ cu. ft.

Under abnormally good conditions, however, the exit temperature may be considerably lower and the fuel consumption less, and under these exceptional circumstances V may fall as low as 133 cu. ft. of exit gas per 1 lb. clinker made.

Substituting these values in formula (1), we have

For good practice—

$$M = 1.263 \times \frac{16.1}{181} d^2,$$

or $$M = 0.1123\, d^2 \text{ tons*/hour} \qquad (2)$$

For abnormally good practice—

$$M = 1.263 \times \frac{16.1}{133} d^2$$

$$= 0.153\, d^2 \text{ tons/hour.}$$

Substituting in these two formulæ the different values of d, we get the output as shown in Table 1.

Remarks on Table

Any wet process kiln possessing a smaller output than given in column (2) is obviously being seriously mismanaged.

The author has often found that rotary kilns are worked at less than half their proper capacity owing to lack of skillful management. The figures given in column (3) are seldom attained with small kilns, but as the diameters increase over 10 ft. the capacities given in column (3) are often attained as the effect of slurry clinging to the brickwork and clinker rings has a less disturbing result in the case of large kilns.

Case II—Yields from Dry Process Rotary Cement Kilns

The data for applying formula (1) to dry process kilns is scanty. In one particular case the fuel consumption was 22.66 tons* of coal per 100 tons* of clinker, and 1 lb. of clinker evolved 3.15 lb. of exit gas at 1900 deg. F., which occupied approximately $V = 186.3$ cu. ft. The terminal velocity of the gas was approximately $S = 20$ ft./sec.

TABLE I—WET PROCESS ROTARY KILNS FOR CEMENT OUTPUT IN TONS* PER HOUR FROM KILNS OF VARIOUS DIAMETERS

Inside diameter of iron shell of kiln, assuming bricks 6 in. thick in decarbonating and drying zones		(1) Inside diameter of kiln (brick to brick) in calcining and drying zones. d feet		(2) Good average practice: $M = 0.1123d^2$. Clinker output in tons* per hr.	(3) Abnormally good practice: $M = 0.153d^2$. Clinker output in tons* per hr.
Ft.	In.	Ft.	In.		
2	0	1	0	0.11	0.15
3	0	2	0	0.45	0.61
4	0	3	0	1.01	1.37
5	0	4	0	1.80	2.45
6	0	5	0	2.8	3.8
6	4	5	4	3.2	4.35
6	6	5	6	3.4	4.6
6	10	5	10	3.8	5.3
7	0	6	0	4.0	5.5
7	6	6	6	4.8	6.4
7	10	6	10	5.3	7.1
8	0	7	0	5.5	7.5
8	6	7	6	6.3	8.6
9	0	8	0	7.2	9.8
9	6	8	6	8.1	11.1
10	0	9	0	9.1	12.4
11	0	10	0	11.2	15.3
12	0	11	0	13.6	18.5
13	0	12	0	16.2	22.0
14	0	13	0	19.0	25.8
15	0	14	0	22.0	30.6
16	0	15	0	25.3	34.5
17	0	16	0	28.7	39.2
18	0	17	0	32.4	44.3
19	0	18	0	36.4	49.7
20	0	19	0	40.5	55.4
21	0	20	0	45.0	61.3

Substituting these values for V and S in the general formula

$$M = 1.263 \frac{S}{V} d^2,$$

we get for dry process kilns

$$M = 1.263 \times \frac{20}{186.3} \times d^2$$

$$= 0.1356\, d^2$$

for average practice.

Whence we derive the following table output:

TABLE II—DRY PROCESS ROTARY KILNS FOR CEMENT OUTPUT IN TONS* PER HOUR FROM KILNS OF VARIOUS DIAMETERS

Inside diameter of iron shell of kiln, assuming a brick lining 6 in. thick in decarbonating and drying zones	Inside diameter of kiln (brick to brick) in calcining and drying zones. d feet	Good average practice: $M = 0.1356d^2$. Clinker output in tons* per hour
Ft.	Ft.	
2	1	0.14
3	2	0.54
4	3	1.22
5	4	2.17
6	5	3.39
7	6	4.88
8	7	6.64
9	8	8.68
10	9	12.20
11	10	13.56
12	11	16.40
13	12	19.52
14	13	22.9
15	14	26.6
16	15	30.5
17	16	34.7
18	17	39.2
19	18	43.9
20	19	49.0
21	20	54.2

*Tons in each instance are British tons of 2240 lb. To convert to tons of 2000 lb. multiply by 1.12.

Remarks on Table

It will be noticed on comparing this table with Table I that dry process kilns yield a somewhat larger output than wet process kilns of the same diameter. Against this, however, must be set the cost and trouble of the preliminary drying cylinders.

Practical Importance of the Law Connecting Output with Size

The law enables us to check whether or not a kiln is being efficiently worked. By virtue of this law the author found that many kilns were only running at half their possible output, and in the case of one works he increased the output from 4 to 6 tons* an hour, resulting in an increased production of over 300 tons* a week, or 15,000 tons* a year.

As the profits at that time were nearly £1 ($5) a ton,* a saving was effected in this one works of about £15,000 ($75,000) per annum.

The application of the law to two very large kilns caused their output to be increased from 7 tons* an hour each to 12 tons* an hour each, or a total weekly increase of 1600 tons.*

Per annum this means 80,000 tons* extra of cement, which, at a profit of 15s. ($4) per ton, meant a saving of £60,000 ($300,000) per annum from one works alone.

This law was applied generally to most of the kilns in Great Britain, and the resulting savings ran into some hundreds of thousands of pounds per annum.

Possibility of Increasing Output for a Given Kiln

Referring to the formula:

$$M = 1.263 \frac{S \cdot d^2}{V}$$

Where M is the clinker output in tons* per hour, S is the terminal speed in feet per second of the exit gas, and V is the volume of the exit gas in cubic feet per 1 lb. of clinker produced.

It will be seen that the output of a given kiln may be increased in two ways:

(1) By any means which reduces the volume V of gas found per pound of clinker produced.

Consequently reducing the fuel consumption per 1 lb. of clinker made or reducing the exit temperature of the exit gas will enable a given kiln to give a larger output.

(2) By any means which increases the terminal speed with which the gas issues from the kiln. The introduction of fans or other means of increasing the terminal speed of the issuing gas has been patented by the writer (B.P. 282868, 1927).

The following is a description of this patent:

"The output of clinker from a rotary kiln is proportional to the quantity of gases passing through the kiln in a given time. Consequently by increasing the linear speed with which the gases traverse the kiln we increase

the clinker output from the kiln. In the ordinary rotary kiln as operated at the present time the gases traverse the kiln at an average linear speed not greater than 22 lin. ft. per sec. through the clinkering and/or decarbonating zone and at an average linear speed of about 16 lin. ft. per sec. in the final or drying zone.

"It is these conditions which limit the output of the rotary kiln to that which prevails in the usual practice at the present time.

"In the present patent (282868) this current process is deviated from inasmuch as in this process the average linear speed of the gases traversing the kiln are maintained substantially higher than those now used in the present day practice. In this new process on the average the gases are maintained at an average linear speed of not less than 30 ft. per sec. in the clinkering zone and/or decarbonating zone of the kiln and not less than 22 ft. per sec. in the final or drying zone, but speeds either greater or less than those mentioned may be used. By this means the output of clinker from a given kiln of the usual dimensions is increased by about 36%. By causing the gases to traverse a kiln at higher average linear speeds than those mentioned a corresponding increase of clinker ouput is secured, but at lower speeds a correspondingly smaller output of clinker occurs.

"In one form of the invention the gases may be made to traverse all zones more rapidly than is the present practice. In another form of the invention the gases may be made to traverse some zones more rapidly than at present, but other zones at the same rate or at a slower rate than is the present practice. In a preferred form of the invention the gases may be made to traverse baffles, the gases being made to pass through the baffles at the high average linear speeds essential for an increased output. This arrangement possesses the advantage that the gases give up their heat effectively to the raw material and at the same time internal radiation losses are prevented whereby an increased output combined with an increased fuel economy is secured. The average linear speed of the gases passing the baffles is measured or defined as the mean length of the sinuous path described by the greater portion of the gas passing through the baffle system divided by the time taken for a small portion of the gas to describe this path. The effect of the baffles is to make the gases passing through a kiln describe a longer path than when passing through a kiln not so fitted. So that the effect of placing baffles in a kiln is to make the kiln act as a longer kiln. This variation in the rate of travel of the gases in the different zones of the kiln may be brought about by enlarging or contracting the cross sectional area of the different zones and/or by inserting baffles therein.

"One method of carrying out the invention is to place a powerful fan at the end of the kiln of such a horse power as to cause the gases to traverse the kiln at average linear speeds substantially greater than those prevailing at the present time. In order to protect the fan from the high temperatures of the issuing gases the latter may be cooled by means of sprays and/or jets of water and/or by passing the gases through a waste heat boiler before allowing the hot gases to impinge on the fan. Instead of a fan we may use a pump injecting cold water into the issuing gas and thus cooling it and forcing it by injector action into the external air.

"Another preferred form of carrying out the invention is to use the baffles in conjunction with a fan or other means of suction applied at the cold end of the kiln, whereby the gases are pulled through the baffles at the high average linear speeds essential for an increased output and at the same time the baffles prevent internal radiation losses."

(*To be continued*)

Discussion on Pozzolanas

FROM THE many examples of Roman masonry and brickwork which have been discovered, bound together with a mortar of extraordinary hardness and durability, it has been concluded by some that the Romans, who of course had no cementing material comparable with modern portland cement, possessed a secret of the manufacture of strong lime mortars which has since been lost.

In a lecture given recently by F. L. Brady, M.Sc., A.I.C., before the London section of the British clayworks managers' organization, he said that the "secret," if secret there be, consists simply in the admixture with fat lime mortar of a suitable pozzolana. The secret, if lost, has been several times rediscovered in later times and, today, there are available a variety of natural and artificial pozzolanas from which it may be predicted with certainty that mortars can be made equally as good as the more ancient materials referred to.

The term pozzolana, possibly unfamiliar, requires explanation. It is used to describe any material which, while not necessarily cementitious by itself, will when mixed with lime combine chemically with it to form a hydraulic cement; that is, one which will set out of contact with air, in contrast with plain fat lime mortars which will only set in the presence of air containing carbondioxide.

The name is derived from the name of an important source of pozzolanas—Pozzoli, near Naples, where the volcanic ash from Mount Vesuvius has been quarried since very ancient times. Vitruvius, in his ancient researches, describes the properties and use of this material and the name of this important and characteristic product has been extended as a generic term to describe all materials, of natural or artificial origin, which possess similar valuable properties.

There are a number of other sources of natural pozzolanas. A particular variety of sand from the Greek Island of Santorin and known as Santorin earth possesses properties similar to the Pozzoli earth. One of the most widely used pozzolanas today is trass. This is a rock of volcanic origin which is found in the Eifel district of Germany and also in Bavaria. To those familiar with the extent to which trass is used in Germany, Holland and Belgium the lack of attention paid to this and similar substances in this country is somewhat surprising. Owing to the increased resistance to the action of sea water which it confers upon concrete in which it is used, it is generally used in marine construction.

The most active pozzolana known today is blast furnace slag which, instead of being allowed to cool slowly in large blocks, has been granulated by bringing the molten slag in contact with water under suitable conditions. Not all slags are equally suitable for preparing an active pozzolana, those high in lime being preferred. What are known as "cold-process" slag cements are simply mixtures of granulated slag with a small proportion of slaked lime.

The Rate of Hydration of Cement Clinker

F. O. ANDEREGG and D. S. Hubbell, in the proceedings of the American Society for Testing Materials, show how standard portland cement particles, whose original dimensions were 15 to 25 microns, approached complete hydration in nine months, while the reaction were practically complete at 12. A white portland cement and a high early-strength cement seemed to reach a similar degree of hydration in about five months. Tricalcium aluminate hydrated very rapidly, particles about 25 microns in diameter being about three-quarters hydrated in three hours. Tricalcium silicate particles of this size required about seven days for a similar degree of hydration, while dicalcium silicate required about 5.5 months. The early rates for the portland cements studied appeared to lie intermediate between those of the two silicates. Mixtures of pure minerals reacted more rapidly than pure minerals usually, especially a mixture approximating portland cement in composition.

The British P. C. A.

IN MUCH THE SAME manner as the Portland Cement Association in this country serves its industry does the British Portland Cement Association, Ltd., function for English manufacturers. The main office is in London and seven branch offices are maintained, with traveling missionaries or representatives available for advice and consultation in each. "Cement-Bound Roads" is the name of a recent bulletin issued by the association, containing a comprehensive description of the method used in making macadam highways more efficient with proper matrix to bind the stones together, provide an impervious surface and prevent internal movement or attrition of the stones.

Methods and Costs at Speed Quarry*

By H. D. Baylor
Vice-President and Works Manager, Louisville Cement Co., and Consulting Engineer, U. S. Bureau of Mines

THIS is the first of a series of papers describing mining methods and costs at cement plant quarries throughout the United States and deals directly with those methods employed and costs obtained at the quarry of the Louisville Cement Co. located at Speed, Ind.

Operates Two Cement Plants

The Louisville Cement Co., Inc., of Louisville, Ky., operates two cement plants at Speed, Ind., which is about 10 miles north of Jeffersonville, Ind. These are the Speed portland cement plant with a daily capacity of 5000 bbl. of portland cement and the Speed Brixment plant with a daily capacity 3500 bbl. of Brixment cement. The Brixment cement is a mason's mortar material resulting from the development of the manufacture of natural cement.

The original vertical kilns which were used to produce natural cement in 1870 are still in use in the Brixment plant.

The original natural cement plant consisted of 32 vertical kilns, 8 pot crushers, 8 buhrs and 8 regrinders. The rock was quarried in the immediate vicinity of the mill. All quarry material was hand-picked for quality and size and transported to the kilns by mules and carts. In about 1894 this rock ledge had dwindled in thickness and the overburden had increased to such an extent that further operation was uneconomical.

Open New Quarry

A new quarry was opened two miles from the plant and has been operated to date, supplying stone for both the Brixment and portland mills. This quarry was opened on the south side of a ravine cutting through the property and worked for several years in a southerly direction. The ledged worked was the Silver Creek limestone. As the quarry proceeded to the south the New Albany black shale was encountered in larger amounts and the ledge thinned until it became expensive to operate.

Test pits dug to the north of the ravine showed the absence of the shale with 8 ft. of clay as the overburden lying directly on the limestone. Operations were then moved to the north. The clay overburden was plowed and removed by wheel scrapers. A Lidgerwood single-drum steam hoist was used to pull both plow and scrapers in place of teams.

The rock was drilled by means of two No. 4 Ingersoll-Rand piston drills mounted on tripods. These drills cut holes 16 ft. deep, starting with a gage of 3½ in. and finishing at 2½ in. The operating power was steam and the drills averaged 60 ft. of holes per 10 hours. Boulders were shot by mud-capping or by hand-drilling short plug holes and block-holing.

The rock was then hand-picked and loaded into 2½ cu. yd. boxes equipped with bails. These were picked up by revolving locomotive cranes and placed on 4-wheel, meter-gage trucks which were hauled to the plant in trains of 6 to 14 cars by an 11-ton Porter steam locomotive.

Labor Costs in 1897

During early operations (in 1897), 14 men were employed loading rock, each man averaging one box per hour for 10 hours. Four men were used in block-holing and shooting boulders. Three men were used in drilling, two on hoisting cranes, nine in stripping, two for clean-up and one as foreman. The rates of pay were as follows:

1	foreman at 17½ cents per hour	$ 1.75
3	drillers at 17½ cents per hour	5.25
4	block-holers at 13½ cents per hour	5.40
14	loaders at 13½ cents per hour	18.90
1	hoistman at 25 cents per hour	2.50
1	hoistman at 15 cents per hour	1.50
9	strippers at 12 cents per hour	10.80
2	clean-up men at 11 cents per hour	2.20
		$48.30

The average daily production by 14 loaders, assuming a cubic yard of stone weighed 3400 lb., was 600 tons.

The labor cost at that date averaged 60% of the total cost of stone. The cost of quarrying stone in 1897 was $1.34 per ton.

Cement Plant Built in 1906

In 1906 the Speed portland plant was erected. By test-pitting and core-drilling it was found that 40 ft. of the 60 ft. of Jeffersonville limestone was suitable for portland cement, and a 20-ft. ledge of this stone was opened up. This ledge consisted of four 5-ft. ledges each having a distinct parting seam.

Later, as the portland production increased, an additional 20 ft. of quarry was opened immediately below the original 20-ft. ledge of portland rock. Steam shovels and additional locomotives were purchased to meet this additional rock demand.

Geology

Rock from this quarry consists of the Silver Creek limestone and Jeffersonville limestone members, of the Devonian age. The Silver Creek formation is 16 ft. thick and consists of a fine grained, bluish to dark gray, argillaceous limestone. The Jeffersonville, lying below the Silver Creek, is 60 ft. thick, ranges from white to bluish and buff in color and is a coarse grained, cherty, argillaceous stone.

A noticeable feature of both formations is the absence of caves, fissures, slips, sink holes and mud seams, except on the surface immediately below the clay. All ledges lie in a horizontal position, and there are free parting seams between all beds. This parting forms a remarkably level quarry floor and excellent working conditions for track and shovel operation. Fig. 1 is a diagrammatic section through the quarry showing the various strata and the thickness of the beds within the strata.

Table 1 gives the chemical analyses of the various beds.

Below the 40-ft. level this Jeffersonville limestone is not fit for portland cement purposes. This rock, however, could be used for commercial stone.

Methods of Prospecting and Exploration

Preliminary exploration in this quarry was accomplished by means of test pits in and near the present operation. Later on a diamond core drill was used and an accurate record kept of the findings. There are no records available on these core-drilling

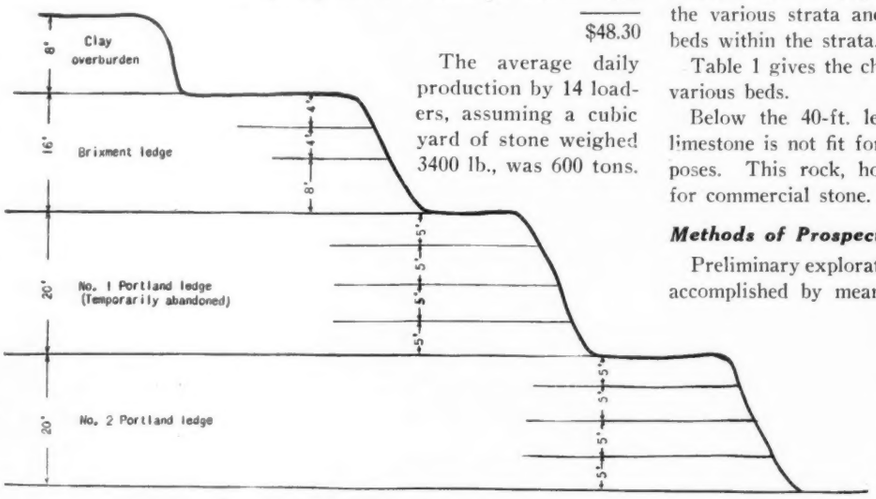


Fig. 1. Diagrammatic section of Louisville Cement Co., Inc., quarry, Speed, Ind.

*Reprinted from U. S. Bureau of Mines Information Circular 6356.

TABLE 1—CHEMICAL ANALYSES CHART

	SiO_2	R_2O_3	Fe_2O_3	Al_2O_3	$CaCO_3$	$MgCO_3$
8-ft. overburden (clay)	67.98	19.53	7.62	11.91	10.45	5.72
4-ft. Silver Creek limestone	10.50	5.66	.....	.....	64.54	19.72
4-ft. Silver Creek limestone	16.20	6.72	.....	.....	54.63	22.83
8-ft. Silver Creek limestone	14.32	6.90	.....	.....	61.75	17.48
5-ft. Jeffersonville limestone	15.04	2.00	.....	.....	77.19	5.77
5-ft. Jeffersonville limestone	3.26	.70	.....	.....	90.81	4.64
5-ft. Jeffersonville limestone	3.60	1.54	.....	.....	92.22	3.64
5-ft. Jeffersonville limestone	4.46	.48	.....	.....	91.04	4.02
5-ft. Jeffersonville limestone	2.64	.58	.....	.....	94.65	2.13
5-ft. Jeffersonville limestone	5.40	.74	.....	.....	91.51	2.35
5-ft. Jeffersonville limestone	.74	.54	.....	.....	93.33	5.39
5-ft. Jeffersonville limestone	3.56	.30	.....	.....	50.64	18.24
20-ft. Jeffersonville limestone	30.60	1.77	.....	.....	46.46	21.17

costs, however. Samples of the crusher run of rock are taken daily and a weekly analysis is run. The rock analysis over a year's run shows very little variation. The overburden, which is clay, has no value at present.

Had Choice of Quarrying Method

The horizontal position of the limestone ledges under a comparatively light and easily handled overburden made the choice of open quarrying automatic. When the need for portland rock arose those ledges of Jeffersonville limestone uncovered by the removal of the Brixment stone offered an ideal source of raw material at a minimum of expense. A second bench in the original quarry was opened in the floor, taking the upper 20 ft. of the Jeffersonville limestone and later as the demand for stone increased a third bench was opened taking a second 20 ft. of this stone. As a result the quarry now supplies an average of 9 tons of stone per ton of overburden removed.

The drainage problem is taken care of by means of a 4000 g.p.m. sump pump direct connected to a 100-hp. motor. The drainage area surrounding the quarry takes in about 200 acres. Very little trouble is experienced with water, however, This lower quarry floor has about 1% dip to the west and the sump is located at the lowest point. In wet weather water accumulates in the western edge of this lower floor and quarrying in this section is abandoned until dry weather sets in.

COST PER TON OF OVERBURDEN
(Period covered, 1929. Tons produced, 96,520)

	Labor	Fuel	Miscellaneous	Total
Loading	$0.0450	$0.0085	$0.0170	.....
Transportation	.0120	.0160	.0235	.....
Disposal	.0400	.....	.....	.....
Cost per ton overburden	.0970	.0245	.0405	$0.1620
Cost per ton rock uncovered	.....	.....	.....	.0254

The company owns several hundred acres of land in the immediate vicinity of the quarry, all of which is underlaid with desirable rock. Part of this is leased for farming purposes until further expansion of the quarry. As will be noted from Fig. 2, the quarry faces are all carried in the arc of a circle. Experience has proven that better fragmentation results when breaking from a circular face than when blasting the stone in a straight line.

Stripping

The 8-ft. clay overburden has at present no commercial value and is removed and hauled to the waste dump as shown in Fig. 2. The clay is dug with a Model 60 railroad-type Marion steam shovel, equipped with a 2½-yd. dipper. The shovel is moved on sections of 70-lb. rails ranging from 5 to 7 ft. in length.

The stripping crew of 17 men consists of an engineer, craneman and fireman on the shovel, four pitmen, a foreman, a locomotive engineer, a brakeman and six dumpmen. The shovel loads the clay into 5-cu. yd. 2-way dump cars handled in trains of 10 cars. These cars are hauled to the dump, a distance of ¼ to ¾ mile and averaging ½ mile. The dump track was built on one slope of a ravine running to the west of the quarry and has been lengthened until it is now approximately ¼ mile in length and 30 ft. high. This dump will handle about 32 hours of stripping without any movement of track.

Stripping is intermittent throughout the dry seasons of the year, inasmuch as the portland quarry rock production is such that 3½ to 4 days' operation give the required tonnage for the week. These portland quarry operators are then used on the stripping operation for the balance of the week. This switching of men makes it possible for the portland quarry crews to have steady employment.

During 1929 stripping operations lasted 613 hours with an average removal of 157 tons per hour, or 1256 tons per 8-hour day. This rate of removal of overburden will readily keep ahead of the quarrying.

Handling Rock at Brixment

As previously noted, the Brixment quarry removes the first ledge of Silver Creek limestone and is shown at *A* in Fig. 2. This ledge has an average production of 656 tons per 8-hour shift.

The quarry has a Marion, Model 60, steam shovel equipped with a traction crawler outfit and a 2½-cu. yd. dipper. Three men are used on the shovel as on stripping, besides one foreman, one jackhammer man and one pitman. Six-yd. cars are used in trains of 9 cars each, which are hauled to the plant by means of an 18-ton Porter locomotive. All rock from this ledge is used with no waste handling necessary.

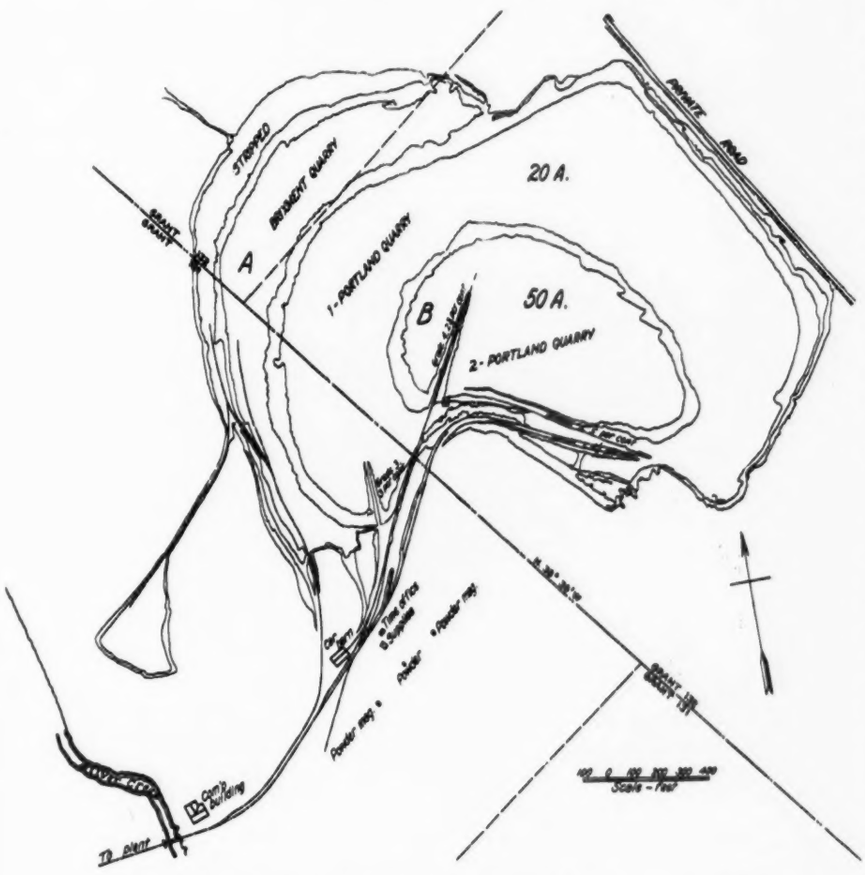


Fig. 2. Plan of quarries, Louisville Cement Co., Inc., operation

Handling Rock at Portland

The first 20-ft. ledge of Jeffersonville limestone uncovered by the advance of the Brixment quarry was abandoned in December, 1927. This quarry face includes about 70 acres stripped and ready for quarrying (*A*, Fig. 2). As previously worked, one Model 60, Marion steam shovel operated on this ledge, but when the lower ledge (*B*, Fig. 2) was opened the shovel was removed to the lower level and another similar shovel added. This system made a more economical operation, as one locomotive was eliminated from the operating schedule.

To work this lower ledge economically it was necessary to construct a grade of 2¾% about 2000 ft. long into the quarry (No. 4, Fig. 2.) Originally there were two grades, one 1500 ft. long about 4½% and another 1200 ft. about 5% (Nos. 1 and 2, Fig. 2).

This new grade shortened the haul from the quarry about 700 ft. and made it possible to use a 9-car train where before only a 6-car train had been used. The two shovels in this lower quarry operated 1445 and 1453 hours, respectively, during 1929 with a total tonnage of 309,910, an average of 107 tons per hour per shovel. Both of these shovels have a crew of three men on the shovel and a foreman and block-hole driller in the pit. Each was formerly a railroad-type shovel, but both are now equipped with traction crawler outfits. This quarry has a 20-ft. face about 3300 ft. long in the arc of a circle. There are about 50 acres of this quarry opened up and about 20 acres remain to be quarried before the abandoned upper ledge is reached.

SUMMARY OF QUARRY COSTS
(Period covered, 1929)

	Stripping	Brixment	Portl'nd
A. Labor:			
Drilling	.....	$0.0180	$0.0150
Blasting	.....	.0075	.0075
Loading	$0.0450	.0742	.0423
Haulage	.0120	.0300	.0250
Miscellaneous	.0400	.....	.....
Total labor	.0970	.1297	.0898
Average tons per man per shift	110	65.6	85.6
Labor cost, per cent. of total cost	60	41	28
B. Power and supplies:			
Explosives	.....	$0.0300	$0.0419
Shovels	$0.0170	.0125	.0358
Locomotives	.0235	.0234	.0703
Air compressors	.....	.0032	.0032
Drills	.....	.0100	.0100
Pumps	.....	.0005	.0005
Fuel (coal)	.0245	.0132	.0132
Overhead	.....	.0175	.0300
Total cost	.0650	.1103	.2049
Cost summary:			
Labor cost	.0970	.1297	.0898
Stripping cost	.....	.0254	.0254
Power and supply cost	.0650	.1103	.2049
Total cost per ton	$0.1620	$0.2654	$0.3201

COST PER TON OF BRIXMENT ROCK
(Period covered, 1929. Tons produced, 160,520)

	Labor	Drill Steel	Power	Fuel	Explosives	Miscellaneous	Total
Drilling primary	$0.0100	$0.0050	.....	.....	.....	.....	$0.0150
Drilling secondary	.0080	.0050	.....	.....	.....	.....	.0130
Blasting primary	.0050	.....	.....	.....	$0.0250	.....	.0300
Blasting secondary	.0025	.....	.....	.....	.0050	.....	.0075
Loading	.0742	.....	$0.0037	$0.0066	.....	$0.0125	.0870
Transportation	.0300	.....	.....	.0066	.....	.0234	.0500
Miscellaneous overhead (local and plant office)	.....	.....	.....	.....	.....	.0175	.0175
Stripping cost	.....	.....	.....	.....	.....	.0254	.0254
Total cost	$0.1297	$0.0100	$0.0037	$0.0132	$0.0300	$0.0788	$0.2654

COST PER TON OF PORTLAND ROCK
(Period covered, 1929. Tons produced, 309,910)

	Labor	Drill Steel	Power	Fuel	Explosives	Miscellaneous	Total
Drilling primary	$0.0100	$0.0050	.....	.....	.....	.....	$0.0150
Drilling secondary	.0050	.0050	.....	.....	.....	.....	.0100
Blasting primary	.0050	.....	.....	.....	$0.0350	.....	.0400
Blasting secondary	.0025	.....	.....	.....	.0069	.....	.0094
Loading	.0423	.....	$0.0037	$0.0066	.....	$0.0358	.0884
Transportation	.0250	.....	.....	.0066	.....	.0703	.1019
Miscellaneous overhead	.....	.....	.....	.....	.....	.0300	.0300
Stripping cost	.....	.....	.....	.....	.....	.0254	.0254
Total cost	$0.0898	$0.0100	$0.0037	$0.0132	$0.0419	$0.1615	$0.3201

Drilling and Blasting at Brixment

The primary holes on the Brixment ledge are drilled with one Ingersoll-Rand X-70 Leyner drifter mounted on a 4-wheel wagon (Fig. 3). This is a piston drill operating on compressed air at 90 lb. per square inch at the drill. The drill will cut 250 ft. of 2-in. holes per 8-hour shift. Formerly one Ingersoll-Rand turntable drill was used, but this was displaced by the X-70 because of lower operating costs and increased drilling speed.

The original turntable type of drill drilling holes 4 in. in diameter cut 8 ft. per hour. The X-70 drill has been found very adaptable to the low ledge method used in this quarry.

Holes drilled by the original turntable drills were 16 ft. deep and were spaced 8 ft. from the face of the ledge and 10 ft. apart, giving a break of 134 tons per hole or 8.4 tons per ft. of hole. Three holes per 8-hour day per drill produced an average of 402 tons per drill per day. Four men were required to operate these drills and it was necessary to operate them 12 to 14 hours a day 7 days a week to keep ahead of the shovel. This type of drill was very unsatisfactory and the repair cost was high.

The Ingersoll-Rand X-70 Leyner drifters were installed as wet drills, but it soon became apparent that greater footage could be obtained using these drills without water. This quarry now averages 200 ft. per 8-hour day per drill with a spacing of 7- by 8-ft., which gives a drilling duty of 940 tons per drill or two-thirds times the tonnage of the older type drills.

A 1¼-in. hollow round drill steel with four changes of bits, 5, 10, 15 and 20 ft. in length, is used. These are 4-point, 15 deg. bits and are gaged from 2¼ to 2¾ in. Two lines of holes are drilled on a 7- by 8-ft. spacing and the back line holes are staggered between holes of the front line.

Drilling and Blasting at Portland

The Portland primary drilling is handled similarly to that on the Brixment ledge and hole spacings are the same. However, there is one X-70 Leyner drifter and an X-71 drifter on this ledge. The two drills are handled by two drillers and one helper. These drills will average 200 ft. each per 8-hr. day. An average of 90 to 100 holes are shot simultaneously.

Drilling costs average 5 c. per foot of hole, including power. Repair costs average $0.0014 per ft. of hole; 40 and 60% Trojan R2 dynamite in 2- by 18-in. cartridges are loaded in column loading. Cordeau-Bickford fuse is used on all primary shots. One No. 8, 12-ft. electric detonator is used at

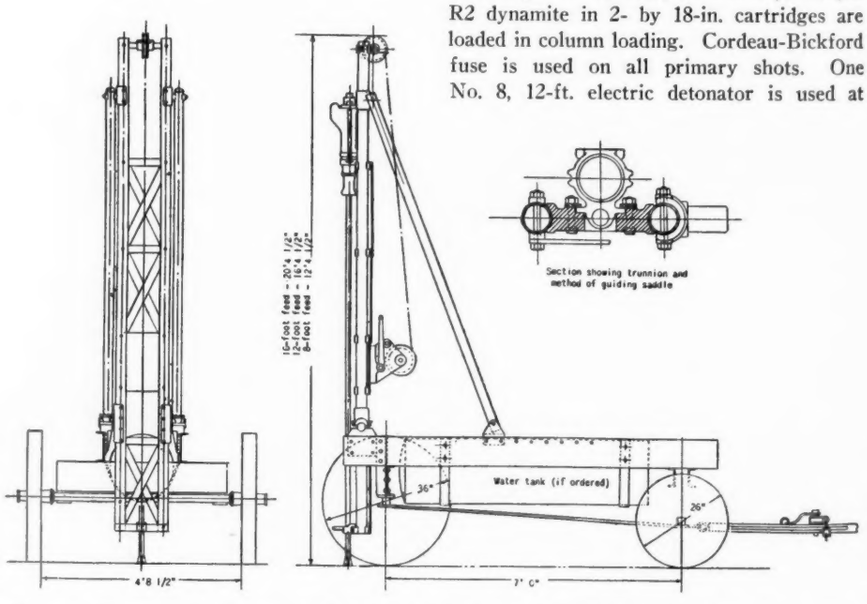


Fig. 3. Type of wagon mounted air drill used in Louisville Cement Co., Inc., quarry

each end of the Cordeau-Bickford trunk line. Shots are made by electric exploding machine of the hand-operated magneto type. In secondary blasting all large rocks are drilled by means of Jackhamers and then shot with 40% dynamite.

There is no means of accurately knowing the ratio of stone broken by secondary blasting to that by primary, but for both ledges it is estimated that 3% of the primary blast is block-holed and shot in the secondary blasting. All rock from this quarry is used in the manufacture of portland cement.

Transportation System Used

The production from the Portland quarry is transported to the plant by means of three steam locomotives in trains of nine cars each. These locomotives are of various sizes, one being a 33-ton Vulcan, another an 18.5-ton Porter, and the third a 15-ton Porter. Two of these locomotives are used on the main lines for hauling to and from the quarry and the third is used in the pit for spotting cars for the shovels and switching loads and empties to and from shovels.

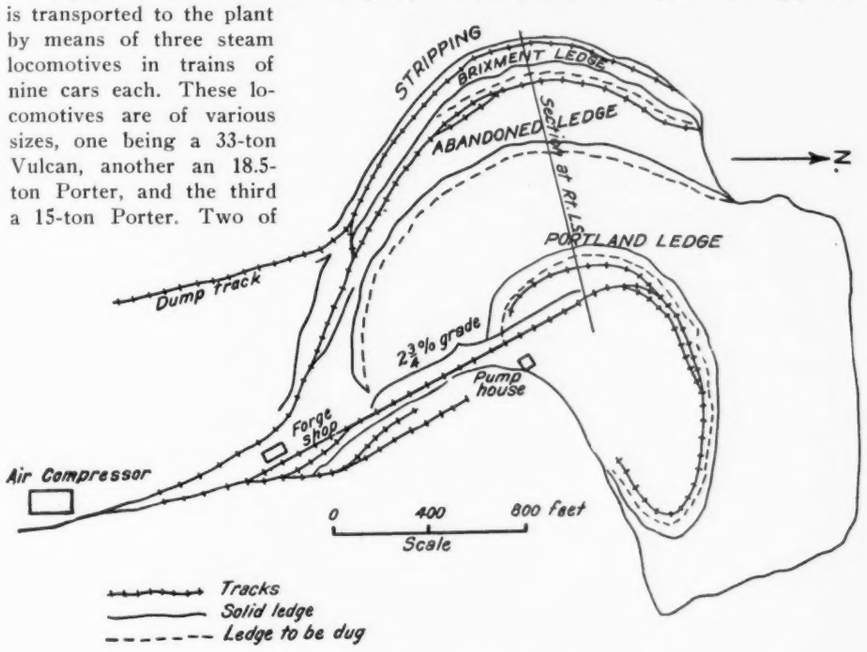


Fig. 4. Map of quarry trackage system

There are about 1¾ miles of double track from the plant to the quarry. One locomotive is used for transporting rock from the Brixment quarry. The internal quarry trackage system may best be understood by a study of the accompanying sketch (Fig. 4). A track foreman and six men maintain the track in the quarry, on the waste dump, and on all main lines of the quarry, spending about two days per week on quarry tracks, one day on main lines and Brixment and three days on dump.

Advantage of the Clean-Up Shovel

During 1928, 5262 man-hours of labor, costing $2631, were employed in cleaning quarry floors after the passage of loading shovels. During five months of 1929 this expense had increased to 3118 man-hours, costing $1559.

To decrease this expense a small ⅜-yd. shovel, mounted on a tractor, was purchased at a cost of $3000. In 1929 and 1930 this unit has more than repaid its cost in clean-up work and on construction excavation around the plant. Fig. 5 illustrates this unit.

Details of the Crushing Plants

The Brixment crushing plant consists of a 36- by 48-in. Traylor Bulldog jaw crusher, belt driven by a 125-hp., 3-phase, 60-cycle, 700-r.p.m., 440-volt motor. The rated capacity of this crusher is 100 tons per hour. No secondary crushing is necessary in this operation, and the discharge from this crusher is less than 7 in. in size.

The product from this crusher passes over a bar grizzly with 1⅝-in. openings, which removes the fines ahead of the kilns. These fines are sent to the Portland plant or sold as ballast as occasion arises.

The Portland crushing plant consists of a gyratory crusher, inclined elevator, feed hopper, apron feeder, hammermill, vertical elevator and shuttle belt. The crusher is a Gates No. 24, manufactured by the Allis-Chalmers Manufacturing Co. It has a rated capacity of 600 tons per hour with a discharge setting of 4½ in. and is driven by a 200-hp., 3-phase, 60-cycle, 505-r.p.m., 440-volt motor through an Allis-Chalmers Texrope drive on 10-ft. to 7½-in. centers. The material from this crusher discharges into a 54-ft. inclined belt elevator which has sixty 17- by 21-in. buckets on 24-in. centers.

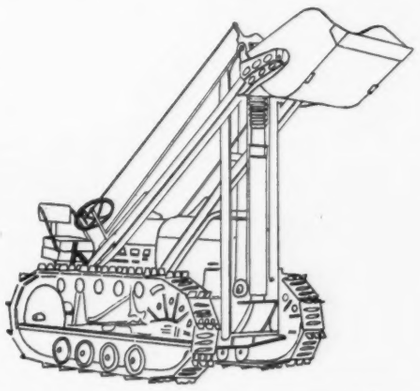


Fig. 5. Small shovel unit used for clean-up work

A 75-hp., 3-phase, 60-cycle, 580-r.p.m., 440-volt motor coupled to a No. 36 Jones spur gear speed reducer having a 3 to 1 ratio is used for driving this elevator, which is inclined at 75 deg. The rock passes from the inclined elevator to the feed hopper which has a capacity of 34 tons, and from there it is discharged on to an apron feeder that conveys it to a Pennsylvania hammermill, which is the only secondary crushing unit used.

This process reduces the product to a material ranging in size from 1 in. to dust. This hammermill has a rated capacity of 300 tons per hour and is driven by a 200-hp., 3-phase, 60-cycle, 705-r.p.m., 440-volt motor direct connected. A vertical elevator carries the discharge from the hammermill to a 26-in. shuttle belt which discharges into the rock storage. The vertical elevator is 54 ft. on centers and has forty-eight 15- by 12¾-in. buckets on 18-in. centers. It is driven by a 25-hp., 60-cycle, 3-phase, 575-r.p.m. 440-volt motor coupled to a No. 24 Jones spur gear speed reducer having a ratio of 3 to 1. The shuttle belt has 20-in. tail pulleys with a 26-in. face and is 89 ft. overall. It is operated by a motor-driven winch.

CRUSHING COST

	Brixment	Portland
Operating labor	$0.0270	$0.0136
Operating supplies	.0055	.0028
Repair labor	.0051	.0028
Repair supplies	.0060	.0100
Power	.0100	.0068
Overhead and depreciation	.0400	.0500
Totals	$0.0936	$0.0860

Wage Scale

All wages are paid on an hourly basis and the following chart will give a fair idea of the type of labor:

Position	No. in quarry	Wage per hour
Engineers	3	$0.65
Cranemen	3	0.55
Firemen	3	0.52½
Foremen	3	0.65
Drillers	3	0.48
Trackmen	8	0.43
Drillers	3	0.58
Drill helpers	2	0.55
Locomotive engineers	4	0.58½
Brakemen	4	0.48
Blacksmith	1	0.72
Helper	1	0.56
Car repairmen	2	0.56

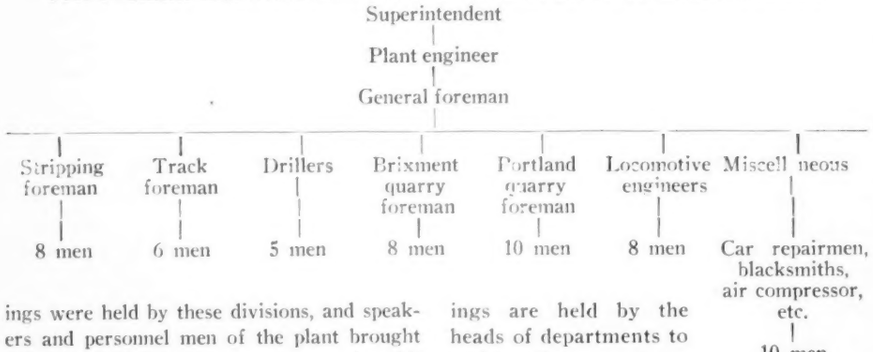
Safety Organization Is Important

Safety work has been carried on at this plant on an extensive scale for about eight years. The plant was formerly subdivided into nine safety divisions with men of similar occupation grouped as near together as possible, each division had its own safety captain and first-aid squad. Monthly meet-

QUARRY MAN-HOUR TABLE
(Period covered, average month in 1929)

	Stripping			Brixment			Portland		
	Tons	Man hours	Man hours per ton	Tons	Man hours	Man hours per ton	Tons	Man hours	Man hr. per ton
Foremen	17,670	212	0.0120	11,770	248	0.0210	28,860	450	0.0156
Powder	.....	.....	.....	11,770	140	.0119	28,860	427	.0149
Drillers	.....	.....	.....	11,770	140	.0119	28,860	288	.0100
Shovel engineers	17,670	106	.0060	11,770	140	.0119	28,860	288	.0100
Shovel cranemen	17,670	106	.0060	11,770	140	.0119	28,860	288	.0100
Shovel fireman	17,670	106	.0060	11,770	140	.0119	28,860	288	.0100
Locomotive engineer	17,670	106	.0060	11,770	193	.0164	28,860	432	.0149
Locomotive brakemen	17,670	106	.0060	11,770	193	.0164	28,860	432	.0149
Drillers	.....	.....	.....	11,770	258	.0212	28,860	386	.0134
Dumpmen	17,670	636	.0360	.....	.....	.....	.....	.....	.....
Pitmen	17,670	770	.0436	.....	.....	.....	.....	.....	.....
Track maintenance	17,670	240	.0135	11,770	162	.0139	28,860	300	.0104
Shovel repair	.....	.....	.....	11,770	53	.0045	28,860	98	.0034
Totals	17,670	2388	.1351	11,770	1807	.1529	28,860	3677	.1275

FIG. 6—CHART SHOWING DELEGATION OF AUTHORITY AT SPEED QUARRY



ings were held by these divisions, and speakers and personnel men of the plant brought safety education to these men as a unit. All safety work was carried on by the personnel department, consisting of the plant superintendent, chief clerk and first-aid men. Various safety contests and campaigns were arranged to stimulate interest.

In 1928 it was decided to place this safety work on a production basis, and the work was turned over to the operating departments. There are now three divisions consisting of the quarry, including the Brixment and Portland quarries and the stripping operation; the kilns, including the breaker, mill and packing house, and the carpenters, iron workers, repairmen, locomotive and trackmen, etc.

Each division meets monthly and reports and discusses unsafe conditions and practices. They make suggestions and reports which are subject to veto by the superintendent but only after thorough study and careful explanation to support the veto.

This move was made because it was felt that over an eight-year educational period the men have become well enough acquainted with the work to carry it on themselves. The responsibility has been placed on the general foreman, subforemen and the man himself and the men feel this responsibility and are doing nicely. As an example, the quarry division has gone six years and two months without a lost-time accident, this being the most outstanding record in the country to date.

Management

Fig. 6 is a chart showing the delegation of authority. The superintendents of the various departments throughout the company organization call foremen's meetings three or four times a year for round-table discussion of operating problems. Weekly meetings are held by the heads of departments to which others are summoned when problems under their particular supervision are under discussion.

Acknowledgments

The author wishes to acknowledge the assistance of J. M. Buchheit, superintendent of quarries, and H. E. Schoonover, quarry engineer, in furnishing data and in compiling this report.

The Organization of Industrial Research

RESEARCH HAS become an indispensable factor in the world's industry. Even the non-technical executive is thoroughly sold on the value of a well-equipped research laboratory, both in personnel and equipment, for the purposes of investigating new products, reductions in manufacturing costs, reduction of personal and property hazards, constant checking up on production and the many other ways in which research has made itself valuable to business.

Ernest B. Benger, Du Pont Rayon Co., Buffalo, N. Y., in an article written for *Industrial and Engineering Chemistry*, states that the functions of organization in research may be looked upon as comprising, briefly, the following items:

(1) Securing the Man. Money has been wasted in assigning difficult problems to men who could not be expected by training or experience to handle them and through assigning small problems to big men. New men must be constantly supervised to insure maximum efficiency. Heads of research departments should not hesitate to criticise and offer suggestions so as to avoid misunderstandings that may go on for years. An annual interview of careful and full criticism of each man is recommended.

(2) Providing the Money. Mr. Benger cites the example of an organization in position to trust its laboratory director with a clear knowledge on expenditures which authorizes the spending of 1% of gross sales with the provision if sales dropped to 50% of production capacity the laboratory director should spend on the basis of 50% appropriation.

(3) Furnishing the Atmosphere. Confidence, good morale and efficiency follow the service rendered by a research department provided with members who are given a complete understanding of the problem to be solved and then placed on their own responsibility to successfully carry out their work. New conditions and facts must not be fed to the research man during the progress of his work. He should be enabled to make contacts with other departments in his own organization as well as with organizations on the outside so that his knowledge of his science and related sciences will not be allowed to stagnate. He should be rewarded with executive responsibility and proper remuneration.

Organization to Supply Accessory Service. The research chemist should be just as free in working at the heart of his problem as he should be freed from clerical and mechanical functions as far as possible, according to Mr. Benger. He sets down some of the services which can be rendered the research man as follows:

(1) The employment of chemists should be carried on chiefly by the employment or personnel office. The final hiring must be done, as stated before, by the laboratory director.
(2) Stenographic service should be of a high order and plentiful.
(3) The library should adopt the usual attitude of librarians of relieving its patrons of as much searching as possible. Translations may, if necessary, be included in library functions. Circulation of magazines, new books and abstracts can be supervised by the librarian.
(4) The files should be complete and well organized, and records should be easily and quickly available.
(5) Clerical and accounting functions should be conducted with the minimum of assistance from the chemists.
(6) Analytical work should be done by an analytical staff, so that the research chemist will never need to carry out analytical work or to devise methods of analysis; his advice and assistance should be freely available, of course.
(7) Engineering and mechanical experimental work connected with research should be handled entirely by specialists.
(8) The use of production facilities for special tests and observations should be delegated as far down the line as possible without sacrificing the intelligent observation which is required. The operation of the semi-works plant should not engage the attention of the research chemist any further than is required to get his particular production through in a satisfactory way.
(9) Patent service and work, both defensive and offensive, should be segregated. The research chemist should be patent-conscious, but should give only the minimum attention to this field, except as a source of information.
(10) In a large organization the editorial work on reports should be left to a specialist.
(11) Information obtainable from sales, from sales service and through complaints should be made easily available.
(12) The chemist should not be required to do his own purchasing or shopping about for materials after he knows what he wants.
(13) Advice and guidance from consultants should be made available wherever possible as a routine affair.
(14) University relations should be free and easy and the chemist may frequently find it advantageous to employ university or other laboratories for the solution of certain phases of his problems.

Sales and Distribution of Lime in 1929

THE LIME SOLD by producers in the United States in 1929 amounted to 4,269,768 short tons, valued at $33,478,848, according to figures obtained from a compilation of reports made by lime manufacturers to the United States Bureau of Mines, Department of Commerce. This represents a decrease of 4% in quantity and of 8% in value as compared with 1928. Sales of hydrated lime, which are included in these figures, amounted to 1,550,771 tons, valued at $12,771,525, a decrease of 4% in quantity and of 6% in value. The average unit value of all lime showed a decrease from $8.18 a ton in 1928 to $7.84 in 1929, and that of hydrated lime a decrease from $8.40 a ton in 1928 to $8.24 a ton in 1929.

Sales of lime used in the manufacture of chemicals—2,290,612 tons, valued at $16,787,408—increased 7% in quantity; lime sold for construction—1,640,827 tons, valued at $14,303,539—decreased 17% in quantity, and that sold for agricultural purposes—338,329 tons, valued at $2,387,901—increased 1% in quantity. The accompanying table shows sales of lime by uses in 1928 and 1929.

Ohio, the largest producing state (962,415 tons, valued at $7,935,656 in 1929), showed a decrease of 5% in quantity reported, and Pennsylvania (782,915 tons, valued at $5,896,752, in 1929) decreased 6% in quantity. The total number of plants that reported operations in 1929 was 381, 30 less than in 1928. Although lime manufacturing plants are distributed throughout the United States, there is much interstate shipment, and the accompanying table shows total sales, shipments into and from the different states and their apparent and per capita consumption.

On the hydrated lime sold by producers in the United States in 1929, Ohio produced 615,072 short tons (9% less than in 1928). Of this, 576,802 short tons (94%) was sold for construction and was widely distributed throughout the continental United States. The accompanying table shows tonnage distribution of hydrated lime from plants in the United States and in Ohio, as reported to the Bureau of Mines, presented for blocks of contiguous states roughly comprising various freight-rate zones for 1928 and 1929.

Study Ontario Deposits

A STUDY OF fireclay, kaolin and silica sand deposits of the Mattagami and Missinaibi rivers has been made by R. J. Montgomery and R. J. Watson of the Ontario Department of Mines.

The clays are (1) surface or glacial and post-glacial clays, including bouldér clay or till, stoneless glacial clays, swamp clays, flood-plain silts, and marine clays, and (2) Mesozoic clays, which are much more refractory and include kaolin and fire clays. Kaolin and silica sand occur together, necessiting washing for a pure product.

LIME SOLD BY PRODUCERS IN THE UNITED STATES, 1928 AND 1929, BY USES

Use	1928 Short tons	1928 Value	1929 Short tons	1929 Value
Agricultural	333,910	$ 2,287,558	338,329	$ 2,387,901
Building	1,986,465	17,706,420	1,640,827	14,303,539
Chemical:				
Glass works	76,161	588,305	75,283	544,760
Metallurgy	504,248	3,055,081	578,488	3,258,992
Paper mills	429,334	3,260,733	411,017	3,057,350
Refractory lime (dead-burned dolomite)	448,761	4,283,036	488,032	4,261,942
Sugar refineries	22,678	280,186	20,758	249,190
Tanneries	64,464	494,983	67,046	516,207
Other uses	592,391	4,493,333	649,988	4,898,967
Total chemical	2,138,037	$16,455,657	2,290,612	$16,787,408
	4,458,412	$36,449,635	4,269,768	$33,478,848
Hydrated lime (included in above totals)	1,612,818	$13,540,215	1,550,771	$12,771,525

SHIPMENTS OF HYDRATED LIME FROM PLANTS IN THE UNITED STATES AND IN OHIO, 1928-29, BY DESTINATIONS

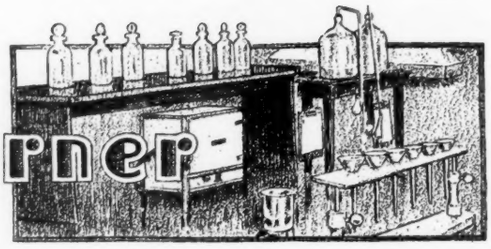
Destination	From all plants: Short tons	From all plants: Distribution	From Ohio plants: Short tons	From Ohio plants: Distribution	From Ohio plants: Group total
1928					
Illinois, Indiana, Michigan, Ohio	417,086	25.9%	306,733	45.5%	73.5%
Del., D. C., Md., N. J., N. Y., Penn., W. Va.	647,443	40.1	249,683	37.0	38.6
Conn., Me., Mass., N. H., R. I., Vt.	77,749	4.8	25,582	3.8	32.9
Fla., Ga., N. C., S. C., Va.	145,884	9.1	35,083	5.2	24.0
Ala., Ky., La., Miss., Tenn.	92,607	5.7	19,983	3.0	21.6
Ark., Ia., Kan., Minn., Mo., Neb., Okla., Tex., Wis.	165,016	10.2	30,708	4.5	18.6
Ariz., Calif., Colo., Ida., Mont., Nev., N. M., N. D., Ore., S. D., Utah, Wash., Wyo.	54,085	3.4	2,961	0.4	5.5
Undistributed and exports	12,948	0.8	3,911	0.6	30.2
	1,612,818	100.0%	674,644	100.0%	41.8%
1929					
Illinois, Indiana, Michigan, Ohio	389,273	25.1%	274,269	44.6%	70.5%
Del., D. C., Md., N. J., N. Y., Penn., W. Va.	630,312	40.6	224,123	36.4	35.6
Conn., Me., Mass., N. H., R. I., Vt.	78,394	5.1	25,019	4.1	31.9
Fla., Ga., N. C., S. C., Va.	121,095	7.8	31,163	5.1	25.7
Ala., Ky., La., Miss., Tenn.	75,673	4.9	18,314	3.0	24.2
Ark., Ia., Kan., Minn., Mo., Neb., Okla., Tex., Wis.	179,948	11.6	31,663	5.1	17.6
Ariz., Calif., Colo., Ida., Mont., Nev., N. M., N. D., Ore., S. D., Utah, Wash., Wyo.	60,479	3.9	2,998	0.5	5.0
Undistributed and exports	15,597	1.0	7,523	1.2	38.2
	1,550,771	100.0%	615,072	100.0%	39.7%

LIME SUPPLIES AVAILABLE FOR CONSUMPTION IN CONTINENTAL UNITED STATES IN 1929, BY STATES, IN SHORT TONS

State	Sales by producers	Shipments: From state	Shipments: Into state	Supply: Hydrated lime	Supply: Quicklime	Supply: Total	Lb. per capita*
Alabama	209,260	58,963	8,342	22,037	136,602	158,639	120
Arizona	42,971	13,988	41	1,284	27,740	29,024	133
Arkansas	33,647	22,757	3,488	4,472	9,906	14,378	16
California	49,753	4,231	43,140	26,394	62,268	88,662	31
Colorado	7,046	754	13,966	7,483	12,775	20,258	39
Connecticut	35,180	22,644	26,599	13,369	25,766	39,135	49
Delaware	.....	.....	47,105	16,797	30,308	47,105	395
District of Columbia	.....	.....	17,899	14,769	3,130	17,899	74
Florida	(†)	.....	(†)	17,749	8,794	26,543	36
Georgia	10,757	5,230	27,494	26,389	8,632	35,021	24
Idaho	(†)	(†)	2,744	1,622	1,159	2,781	12
Illinois	119,382	50,159	254,173	110,762	212,634	323,396	85
Indiana	116,795	75,740	63,297	49,122	55,230	104,352	65
Iowa	(†)	.....	(†)	13,364	39,442	52,806	43
Kansas	.....	.....	34,818	18,517	16,301	34,818	37
Kentucky	(†)	(†)	63,895	12,432	55,436	67,868	52
Louisiana	.....	.....	65,883	12,658	53,225	65,883	62
Maine	92,428	40,689	25,014	11,199	65,554	76,753	192
Maryland	54,029	26,438	73,924	51,164	50,351	101,515	125
Massachusetts	133,644	104,296	72,216	38,155	63,409	101,564	48
Michigan	91,468	46,569	133,758	85,328	93,329	178,657	74
Minnesota	(†)	(†)	14,729	12,966	15,384	28,350	22
Mississippi	.....	.....	24,685	10,019	14,666	24,685	25
Missouri	316,579	233,827	14,658	33,625	63,785	97,410	54
Montana	(†)	(†)	1,384	2,536	12,539	15,075	56
Nebraska	.....	.....	11,927	7,138	4,789	11,927	17
Nevada	(†)	(†)	1,206	606	1,200	1,806	40
New Hampshire	.....	.....	14,873	3,351	11,522	14,873	64
New Jersey	1,644	.....	163,105	103,321	61,428	164,749	82
New Mexico	(†)	(†)	15,417	1,959	14,218	16,177	76
New York	104,614	43,316	368,482	208,554	221,226	429,780	68
North Carolina	(†)	(†)	71,530	36,299	39,131	75,430	48
North Dakota	.....	.....	6,897	5,388	1,509	6,897	20
Ohio	962,415	659,496	95,104	144,061	253,962	398,023	120
Oklahoma	(†)	.....	26,916	16,317	10,679	26,996	23
Oregon	2,486	926	7,311	2,867	6,004	8,871	19
Pennsylvania	782,915	281,602	298,019	219,623	579,709	799,332	166
Rhode Island	1,885	306	17,644	9,434	9,789	19,223	56
South Carolina	.....	.....	16,908	10,046	6,862	16,908	20
South Dakota	(†)	.....	(†)	2,441	3,013	5,454	16
Tennessee	172,936	135,100	9,925	18,527	29,234	47,761	37
Texas	97,332	28,316	4,932	40,808	33,140	73,948	25
Utah	46,581	2,829	344	4,143	39,953	44,096	175
Vermont	53,128	49,525	1,516	2,886	2,233	5,119	29
Virginia	153,170	104,455	40,833	30,612	58,936	89,548	74
Washington	31,598	7,745	4,757	2,681	25,929	28,610	37
West Virginia	308,600	276,198	37,635	15,810	54,227	70,037	81
Wisconsin	130,902	86,391	79,631	32,741	91,401	124,142	85
Wyoming	.....	.....	1,781	1,349	432	1,781	16
Undistributed	90,125	45,464	76,804	.....	.....	.....	.....
Total	4,253,270	‡2,425,954	2,406,749	1,535,174	2,698,891	4,234,065	69

*Based on Bureau of the Census preliminary statement for 1930; no estimate made for 1929. †Included under "Undistributed." ‡Includes 19,205 tons of lime exported or unspecified by producers as to destination.

The Chemists' Corner



Lime and Magnesia Determination in Portland Cement Raw Mix

By G. W. Jordan

Chief Chemist, Southern States Portland Cement Co., Rockmart, Ga.

PROBABLY the most frequently used analysis in portland cement laboratories is the so-called acid-alkali determination of the combined calcium and magnesium carbonates in the raw mix, with a separate or supplementary determination of magnesia. While the ultimate composition of the cement clinker cannot be calculated very accurately from these analyses, due to several variable factors besides the lime and magnesia content, there is a temporary definite relationship between the results of the acid-alkali determinations and some factor obtained by the clinker analysis, such as the lime-silica index, and the constancy of this relationship may be determined by a frequent comparison between the two. In addition a rapid method for determining the magnesia alone is frequently desirable.

In the acid-alkali determination the procedure is generally similar to the following: Solutions of approximately 2/5N HCl and 2/5N NaOH are prepared, Iceland spar being used as a primary standard and phenolphthalein as the indicator. In making the determination one gram of the mix is weighed into a convenient size Erlenmeyer, 50 c.c. of the 2/5N HCl added, the flask attached to a condenser and boiled on the source of heat until the solution is complete. The solution is then cooled and the excess acid titrated with NaOH of equal strength, phenolphthalein being used as an indicator.

For making the magnesia determination in the same sample methods too numerous to describe have been proposed, but the majority of them may be divided into two classes: Those which continue the titration with the NaOH solution to a definite pH, at which point all the magnesia will have been precipitated as $Mg(OH)_2$; and those which precipitate the magnesia by adding an excess of standardized NaOH and then titrating back with HCl of equal strength, an indicator such as phenolphthalein being used.

Against the above procedure several objections can be raised. In the first place, Iceland spar is very frequently not the 100% pure calcium carbonate which it is supposed to be. The writer has obtained samples of Iceland spar from one of the nation's leading chemical supply houses labeled "select for standardizing" which, on careful analysis, was found to contain as high as 1½% of impurities. Obviously, to standardize with a primary standard of uncertain purity is to defeat our purpose before we start.

In determining the combined lime and magnesium carbonates inaccurate results may be obtained unless all the conditions are favorable. According to the best authorities a saturated solution of $Mg(OH)_2$ at 15 deg. C. has a pH of about 10.3, while the color change of phenolphthalein covers a pH range of from 8.4 to 10.2. From this it is apparent that appreciable amounts of $Mg(OH)_2$ may be precipitated during this titration if certain factors, as the temperature, are not right. This possibility of error may be lessened by selecting a more suitable indicator.

When this titration is continued for the determination of magnesia other objections arise. The writer, in his study of shales and clay used in the manufacture of cement, has found as high as 5% of iron oxide and alumina soluble in 2/5N HCl, with corresponding amounts in the raw mix. While it is true that, in the acid-alkali titration, these oxides are precipitated before neutrality is reached, $Al(OH)_3$, as is well known, is strongly soluble in an excess of NaOH, with the consequently erroneous results in the amount of magnesia obtained. It is equally true that $Mg(OH)_2$ is strongly hydrolyzed during this titration causing the end point to appear too soon.

While these two errors tend to neutralize each other it does not necessarily follow that the net result will be correct. If we determine the magnesia content by adding, to the initial titration, an excess of NaOH and then titrating back with HCl of similar strength the same objections will apply. If the interfering iron and aluminum oxides, after being precipitated, are removed by filtration, the magnesia precipitated as $Mg(OH)_2$ by an excess of NaOH, the $Mg(OH)_2$ filtered off and the excess NaOH titrated back with standard HCl, as is the procedure in one method, the fact still remains that some $Ca(OH)_2$ may be precipitated in the strongly alkaline solution and the almost certainty that insoluble lime carbonate will be formed during the latter filtration.

From a study of the foregoing it would seem that all of these objections might be met if we proceed as follows: Standardize the NaOH and HCl solutions using a primary standard of unquestionable purity; determine the lime and magnesium carbonates as previously described, but using an indicator whose color change occurs after all the iron and aluminum oxides have been precipitated, but before any aluminum hydroxide will have been redissolved or any magnesium hydroxide precipitated; render the lime content harmless by precipitating it as an insoluble oxalate and filtering it off along with the precipitated iron and aluminum hydroxides; applying the principle of hydrolytic precipitation, determine the magnesia content by precipitating it in a neutral solution, the end point being determined by hydrolysis of the added reagent when the slightest excess has been added. For this latter purpose the writer has used a modified method for determining the hardness of water, first suggested by Blacher two decades ago and later modified by Fromboese and others. The complete method follows:

Solutions of exactly 2/5N HCl and 1/5N NaOH are prepared, potassium acid phthalate of a purity equal to that furnished by the Bureau of Standards being used as an alkametric standard and phenolphthalein

as an indicator. In the determination one gram of the raw mix is weighed out and placed in a 200-c.c. graduated flask, such as is used in fertilizer analysis, instead of in the customary Erlenmeyer; 50 c.c. of the 2/5N HCl are then added and the flask attached to an air or water condenser and boiled for two or three minutes until the solution is complete. After removing from the condenser and while still hot enough to exclude any CO_2, the excess acid is titrated with 1/5N NaOH, methyl red being used as an indicator. As a small error will be introduced due to the difference in pH of the methyl red and phenolphthalein indicators, 0.05 c.c. is added to the NaOH reading. This corrected reading, subtracted from 100, will give the combined lime and magnesium carbonates expressed as their lime equivalent.

The flask is again placed on the source of heat until boiling just begins and at the same time about 50 c.c. of an N/2 solution of *neutral* sodium oxalate is also heated to boiling. Add the sodium oxalate to the solution carefully, taking precautions that it does not boil over, remove from the heat and cool in running water. If the precipitation has been complete the precipitate will quickly settle leaving a clear transparent solution above. When cool dilute to the 200 c.c. mark, mix thoroughly and filter through a close textured folded filter. When sufficient of the filtrate has been obtained pipette 100 c.c. into a convenient size beaker. To this filtrate, which should now be alkaline to methyl red but neutral to phenolphthalein, add a few drops of phenolphthalein and precipitate the magnesia with an N/10 dilute alcohol-glycerine solution of potassium palmitate. This added reagent should be *just* alkaline to phenolphthalein and contain only c. p. material.

The end point, indicated by the red color of phenolphthalein, is reached when all of the magnesia has been precipitated as an insoluble palmitate and the slightest excess of potassium palmitate added. From the number of c.c. used in precipitating the magnesia subtract 0.3 or 0.4 c.c., this being the amount necessary to give a color change with phenolphthalein in a blank solution just alkaline to methyl red. Multiply the corrected reading by two and record the result as MgO. One c.c. N/10 potassium palmitate equals 0.0020 grams MgO.

For making the determinations according to this method no longer a period of time will be required than that of the ordinarily used methods and the results will be, in the writer's opinion, much more accurate.

Method for Determining Carbon Dioxide in Carbonates*

By C. A. Jacobson and John W. Haught
West Virginia University, Morgantown, W. Va.

FOR many years it has been the privilege of one of the writers to test a number of the most highly recommended methods for determining carbon dioxide in carbonates and to evaluate their merits. This was accomplished in connection with a course in advanced quantitative analysis at the West Virginia University. In order to ascertain the degree of success the average student would have in analyzing a limestone or dolomite by a given method, the same sample was submitted to groups of students to be analyzed by different methods. Upon checking over the results it was concluded that a modification might be made so that better and more uniform results would be obtained by the analyst who is not an expert in this field.

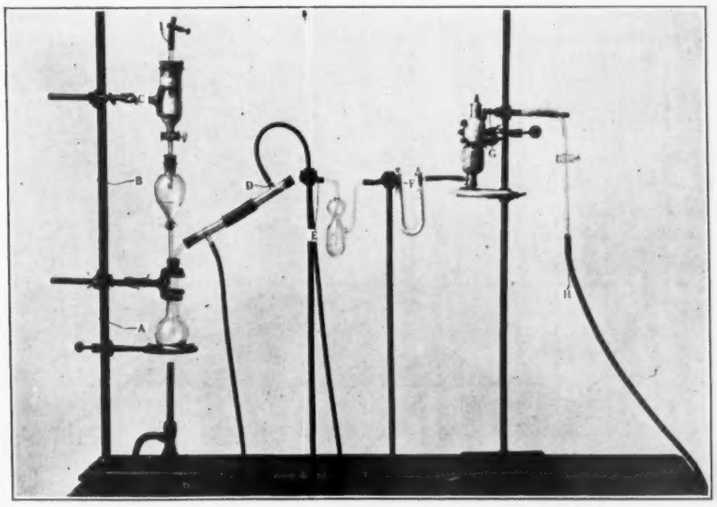
Apparatus

The apparatus is shown in the accompanying illustration. The sample is weighed into the 100-cc. round-bottom flask, *A*, closed by a rubber stopper holding the separatory funnel, *B*, and the bent tube of the condenser, *D*. The stem of the funnel *B* is drawn out to a capillary opening, ending about an inch from the bottom of the flask. The separatory funnel is in turn fitted with a glass-stoppered absorption tube, *C*, containing Ascarite provided to remove carbon dioxide from the aspirated air after the reaction is over. The condenser is made by cutting off the closed ends of two small side-neck test tubes and fitting the cut ends together with a piece of rubber tubing. Tube *E* serves the dual purpose of absorbing most of the moisture from the carbon dioxide and permitting the regulation of the flow of gas through the apparatus. The U-tube *F* is filled with Dehydrite for the purpose of taking out the last traces of water. The lower compartment of the Fleming absorption tube, *G*, is filled with Ascarite and the upper compartment with Dehydrite, which serves to retain any moisture that may be formed in the Ascarite bulb during the carbon dioxide absorption. *G* should be of such a size that its weight when filled shall not exceed 100 grams. The upper end of the Fleming bulb is connected with the suction tube, *H*, connected either with a filter pump or an aspirating bottle by means of a glass stopcock inserted between *G* and *H* for the purpose of regulating suction.

Procedure

Before the determination is started the apparatus is carefully tested for leaks by applying suction at *H*. A bubbler (not shown) is inserted between *G* and *H* for this test and then removed. Leaks are seldom encountered, however, if the glass-stoppered joints have been previously tested. All rubber connections are made by heavy wall pure gum tubing. The rubber stoppers used are small, which more readily permit of making tight joints.

Having proved the apparatus tight, about 3 to 4 cc. of water are added to the sample (about 0.7 gram) through *B*, after which about 5 cc. of 60% perchloric acid diluted to 15 cc. with water are measured into *B*, and the absorption tube *C* is then fastened into place. The Fleming absorption bulb, *G*, is weighed, preferably before testing the apparatus for leaks. A slightly diminished pressure in the apparatus is made by turning the stopcock inserted between *G* and the aspirating bottle, and then the acid in *B* started to drop into *A*, in very small droplets at first. As the carbon dioxide is generated, the bubbles can be counted in *E* and the speed of the reaction so controlled that only about one bubble per second passes



Apparatus used for determining carbon dioxide in carbonates

*Reprinted from the Analytical Edition of *Industrial and Engineering Chemistry*.

CARBON DIOXIDE DETERMINATIONS

Weight of Sample Grams	Acid	Absorbent	—CO_2 Obtained— Gram	%	Accepted Value for CO_2 %	Error %
		No. 46 Analyzed Limestone				
0.69206	HCl	KOH in Geissler	0.2828	40.86	40.86	0.00
0.69626	HCl	KOH in Geissler	0.2844	40.84	40.86	—0.02
0.60986	HCl	KOH in Geissler	0.2479	40.65	40.86	—0.21
0.74196	H_2SO_4	KOH in Geissler	0.28402	38.28	40.86	—2.58
0.72676	H_2SO_4	KOH in Geissler	0.2762	38.00	40.86	—2.86
0.61086	$HClO_4$	KOH in Geissler	0.2495	40.84	40.86	—0.02
0.65406	$HClO_4$	KOH in Geissler	0.2677	40.92	40.86	+0.06
0.72956	$HClO_4$	KOH in Geissler	0.2982	40.87	40.86	+0.01
0.75276	$HClO_4$	KOH in Geissler	0.30832	40.96	40.86	+0.10
0.59236	$HClO_4$	Ascarite	0.2411	40.70	40.86	—0.16
0.71026	$HClO_4$	Ascarite	0.28862	40.63	40.86	—0.23
		Pure Iceland Spar				
0.8494	HCl	Ascarite	0.3736	43.98	43.97	+0.01
1.1499	HCl	Ascarite	0.5062	44.02	43.97	+0.05
0.6667	$HClO_4$	Ascarite	0.2919	43.78	43.97	—0.19
0.8741	$HClO_4$	Ascarite	0.3840	43.93	43.97	—0.04
		No. 48 Analyzed Limestone				
1.0253	HCl	Ascarite	0.3042	29.67	29.79	—0.12
1.0497	HCl	Ascarite	0.3122	29.74	29.79	—0.05
0.8578	HCl	Ascarite	0.2539	29.68	29.79	—0.11
0.4778	$HClO_4$	Ascarite	0.1440	30.13	29.79	+0.34
0.4512	$HClO_4$	Ascarite	0.1350	29.92	29.79	+0.13
0.4197	$HClO_4$	Ascarite	0.1250	29.79	29.79	0.00
0.5864	$HClO_4$	Ascarite	0.1739	30.10	29.79	+0.31
		Dolomite				
0.7802	$HClO_4$	Ascarite	0.3693	47.33	47.24	+0.09
0.70435	$HClO_4$	Ascarite	0.33365	47.36	47.24	+0.12
0.72385	$HClO_4$	Ascarite	0.3407	47.06	47.24	—0.18
1.2021	$HClO_4$	Ascarite	0.5700	47.41	47.24	+0.17

through the tube with a 4 mm. bore. Two bubbles per second is too fast for perfect absorption. As the reaction in *A* slows down, the acid is added faster until all has gone in. Then the stopcock in *C* is closed and the flask *A* gently heated, so as to maintain the same rate of flow of gas through *E*, until the liquid in *A* boils. Boiling is continued for a minute, and then the flame turned down gradually. As soon as the tendency to suck back appears, the stopcock in *C* is slowly opened to allow air to enter and replace the gradually condensing water vapor in *A*. The aspiration of purified air through the apparatus at the same rate is continued for about an hour after the liquid in *A* has attained room temperature. The increase in weight of *G* represents the weight of carbon dioxide liberated from the sample.

The above procedure also holds when hydrochloric and sulfuric acids are used for decomposing the carbonate, and when a Geissler tube containing a 50% solution of potassium hydroxide is substituted for *G* as the weighed absorption vessel. Precautions, however, must be taken to prevent hydrochloric vapor from reaching the absorption vessel as explained below, and to prevent loss of water from the Geissler by using fresh Dehydrite in the guard tube accompanying it.

Some of the determinations made with this apparatus are given in the accompanying table.

Observations

A mass of evidence is at hand showing that carbonates may be analyzed by this method with more uniformly accurate results than any other tried, and that its simplicity of construction makes it possible for any one with but a meager knowledge of chemistry to assemble the parts and carry out a determination.

When sulfuric acid is used to decompose the carbonate too low results are obtained, but equally good results may be had with hydrochloric and perchloric acids, the former requiring an extra absorption tube containing anhydrous copper sulfate on pumice to retain the volatilized acid. For this reason perchloric acid is the preferable acid to use in the analysis of this type of carbonates.

Revised Procedure for the Determination of Uncombined Lime in Portland Cement

PAPER No. 23 under the above title has been published by the Portland Cement Association Fellowship at the Bureau of Standards, Washington, D. C.

This paper by William Lerch and R. H. Bogue gives a revised procedure for this determination using the ammonium acetate titration method by which a greater precision is gained, and also gives an analysis of the data obtained with this method.

Eight cements, some commercial and others prepared to give a wide range of uncombined lime values, were used, and samples of each were sent to 17 laboratories for determination according to the revised procedure.

The mean uncombined lime values determined by the laboratories for each cement, and the per cent. average deviation from the mean, were used to plot a curve showing the relation between uncombined lime and per cent. average deviation.

A second curve was also plotted showing the relation between uncombined lime and the probable error, defined as the deviation from mean within which one-half of the determinations may be expected to fall, and from which curve the probable error of any group of determinations may be read for mean values of uncombined lime up to 7%. This curve showed a probable error of 0.2% for a mean value of uncombined lime of 1%, 0.3% error for a value of 2.5% uncombined lime and 0.4% error for a value of 7% uncombined lime.

Urges Study of Geology

EVIDENTLY the mining men of South Africa have not been giving much attention to a study of the country's geology, for one of the papers read at a recent geological conference urged a more intensive study of the subject on the part of the mining interests.

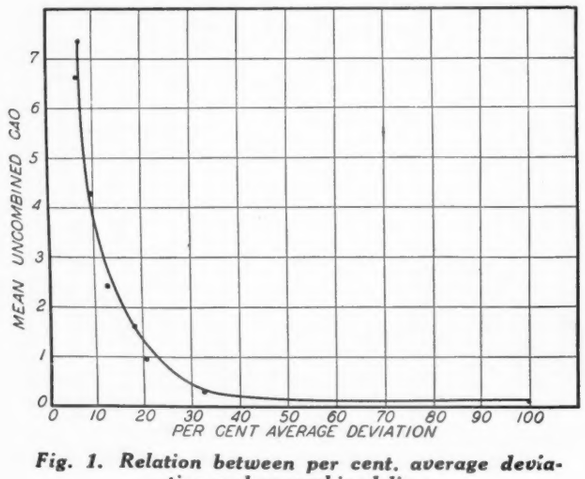


Fig. 1. Relation between per cent. average deviation and uncombined lime

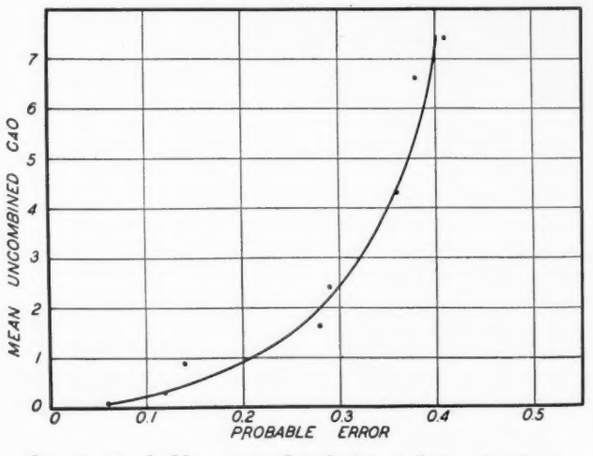


Fig. 2. Probable error of individual determinations of uncombined lime from the mean value of several laboratories

$10,000,000 Merger of Building Material Companies in Chicago

THE Moulding-Brownell Corp. has been formed to take over the businesses and assets of a group of Chicago and midwestern companies engaged in the building material and coal business. The companies in the consolidation include the Thomas Moulding Brick Co., the Brownell Improvement Co., the Federal Stone Co., the Superior Stone Co., the Wisconsin-Wilcox Co. and the American Sand and Gravel Co. Assets of the new concern will total over $10,000,000.

No public financing was involved in the formation of the new company, as stock of the various companies in the merger will be exchanged for stock in the new company.

This consolidation results in a company ranking among the largest in the country with facilities for the production of upwards of 6,500,000 tons of building materials annually and with properties located in four states.

J. R. Sensibar, chairman of the board

J. R. Sensibar Chairman

J. R. Sensibar, president of the Construction Materials Corp., is chairman of the board of the new corporation and W. P. Hodgkins, president of the Brownell Improvement Co., will serve in the capacity of president. Other officers are: T. J. McGuire of the Thomas Moulding Brick Co., vice-president and general manager; Daniel Foley, James W. Adler and F. T. Quilty, vice-presidents; and Daniel J. Gallery, secretary and treasurer.

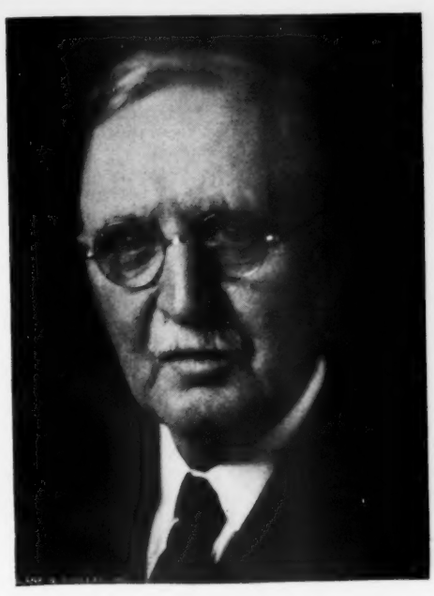
Blank & Stoller photo

W. P. Hodgkins, president of the newly organized Moulding-Brownell Corp., Chicago

The directors of the new company are: Robert F. Carr, W. P. Hodgkins, J. J. McCarthy, Thomas J. McGuire, Thomas C. Moulding, J. R. Sensibar, David E. Shanahan, Charles West and Roland E. Wilcox.

Although not included in the consolidation, Construction Materials Corp. will have a substantial interest in it, and will lay down from its five boats sand and gravel at its Chicago docks for marketing through the new company, which will have 11 retail distributing yards in the Chicago area. The companies concerned in the consolidation have been engaged in the building material industry for many years. The Thomas Moulding Brick Co., the largest distributor of face brick in the district, has been in business more than 60 years, while the Brownell Improvement Co., with the largest single stone crushing plant in the Chicago district, has been operating almost 40 years.

In addition to the facilities for delivery of materials by water, this consolidation brings together four sand and gravel plants and three crushed-stone plants located for easy rail delivery. It is anticipated that these arrangements will result in an efficient and economical producing and marketing operation.



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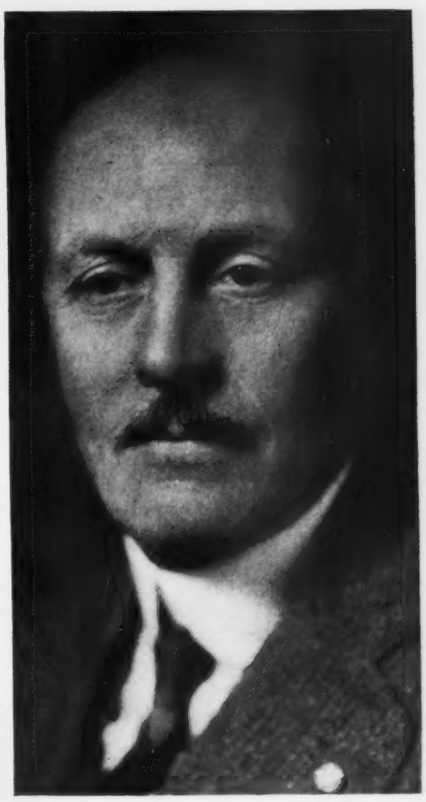
Daniel Foley, vice-president



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Frank T. Quilty, vice-president of the new company

Headquarters of the Moulding-Brownell Corp. will be in the Builders building, Chicago, Ill.

Barite and Barium in 1929

SALES OF crude barite were 277,269 short tons, valued at $1,850,706 in the United States for 1929, an increase of 3% in tonnage and 5% in value over 1928, according to statement from the United States Bureau of Mines. This was the highest production in 10 years. Total sales of barium products and chemicals amounted to 299,225 short tons, valued at $23,154,685, both showing steady increases during the last eight years.

Production of Stone in 1929

PRODUCTION OF STONE in the United States in 1929, exclusive of stone manufactured into lime, cement and abrasive materials, or crushed into sand, amounted to 141,109,580 short tons, valued at $202,692,762, according to a compilation of reports from producers made by the United States Bureau of Mines, Department of Commerce. The figures show an increase of 5% in quantity and 3% in value over the 1928 production figures of 133,869,510 short tons, valued at $196,820,697.

Stone sold for flagging, rubble, furnace flux, manufacturing industries, construction, monumental stone, crushed stone, riprap, agricultural limestone and stone sold for miscellaneous uses increased in quantity and stone sold for paving blocks and curbing decreased.

Building Stone

The building stone sold amounted to 34,761,140 cu. ft., 13% more than in 1928. This includes stone for architectural work and relatively low-priced stone for rough construction, such as foundation, bridges and unshaped face stone for buildings and retaining walls.

More than one-half of the building stone sold was limestone, 17,864,700 cu. ft., valued at $20,649,257, this quantity being 1% more than in 1928. The largest quarry center for building limestone, the Bedford-Bloomington district in Indiana, reported total sales from the quarries of 14,009,850 cu. ft. in 1929, valued at $17,419,183, a decrease of 4% in quantity from 1928. Of this total, 5,345,390 cu. ft., valued at $2,931,816, was sold as rough stone; 4,536,060 cu. ft., $4,073,451, sawed stone and semi-finished stone, and 4,128,400 cu. ft., $10,413,916, cut stone. The mills of this district not operated in connection with the quarries reported sales of 208,660 cu. ft. of sawed and semi-finished stone, valued at $148,777, and 1,161,540 cu. ft. of cut stone, valued at $3,225,713. High grade building limestone quarried at Carthage, Mo., amounted to 278,340 cu. ft.; at Bowling Green, Ky., to 30,620 cu. ft.; at Mankato and Kasota, Minn., to 230,290 cu. ft.

Total sales of sandstone for building (4,870,670 cu. ft., valued at $2,666,314) showed a large increase for 1929 due to increase in stone reported as sold for rough construction. Sandstone for architectural work, including rough, sawed and finished stone, amounted to 1,381,450 cu. ft., valued at $2,345,684. Ohio produced 979,170 cu. ft. New York, Pennsylvania and Wisconsin also reported considerable amounts.

Basalt for construction showed a decrease in quantity from 1928, and various miscellaneous varieties of stone used chiefly for rough construction showed a considerable increase.

Street and Road Work and Concrete

Paving blocks (31,849,130 blocks, valued at $2,942,991) decreased 10% in quantity. Stone sold for flagstones (1,129,690 cu. ft., valued at $666,987) increased 21%. Stone sold for curbing (4,054,700 cu. ft., valued at $3,843,961) decreased 16% in quantity and 18% in value. Total crushed stone amounted to 92,721,260 short tons, valued at $94,387,878 in 1929, an increase of 1.6% in quantity and of less than 3% in value. Crushed stone for concrete and road work (76,174,770 tons, valued at $80,685,493) increased 2% in quantity and decreased slightly in value, and crushed stone reported as used for railroad ballast (16,546,490 tons, valued at $13,702,385) decreased 2% in quantity and increased 4% in value.

STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, 1928–1929, BY KINDS

Kinds	*Short tons	1928—Value	*Short tons	1929—Value
Granite	9,556,500	$ 33,994,527	10,826,730	$ 34,225,110
Basalt	15,327,760	19,693,945	14,871,780	18,946,197
Marble	579,490	16,402,986	553,660	16,545,312
Limestone	96,864,650	110,231,974	100,686,960	113,906,071
Sandstone	4,716,530	10,498,440	5,790,200	11,023,981
Other stone	6,824,580	5,998,825	8,380,250	8,046,091
Total	133,869,510	$196,820,697	141,109,580	$202,692,762

*Approximate.

STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, 1928–1929, BY USES

Use		Quantity	1928—Value	Quantity	1929—Value
Building stone	cubic feet	30,795,530	$ 42,769,904	34,761,140	$ 43,905,123
Short tons—approximate		2,453,330		2,647,410	
Monumental stone	cubic feet	4,203,780	14,966,498	4,410,140	15,848,126
Short tons—approximate		347,760		366,230	
Paving blocks	number	35,426,860	3,113,526	31,849,130	2,942,991
Short tons—approximate		349,290		300,360	
Curbing	cubic feet	4,832,160	4,698,313	4,054,700	3,843,961
Short tons—approximate		383,070		336,360	
Flagging	cubic feet	932,900	717,049	1,129,690	666,987
Short tons—approximate		74,900		87,750	
Rubble	short tons	907,890	1,249,703	907,810	1,324,681
Riprap	short tons	3,993,190	3,865,895	4,212,990	5,030,743
Crushed stone	short tons	91,265,360	94,186,259	92,721,260	94,387,878
Furnace flux (limestone and marble)	short tons	23,123,870	16,957,264	24,393,500	18,034,910
Refractory stone (ganister, mica schist, and dolomite)	short tons	1,348,160	1,745,066	1,558,200	1,807,324
Agricultural limestone	short tons	2,186,870	3,153,848	2,654,580	3,764,775
Manufacturing industries (limestone and marble)	short tons	5,639,750	4,723,810	7,430,749	6,361,201
Other uses	short tons	1,796,070	4,673,562	3,492,381	4,774,062
Total (quantities approximate in short tons)		133,869,510	$196,820,697	141,109,580	$202,692,762

CRUSHED STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES IN 1929, BY STATES AND USES

State	Concrete and road metal Short tons	Concrete and road metal Value	Railroad ballast Short tons	Railroad ballast Value	Total Short tons	Total Value
Alabama	92,710	$151,862	95,940	$54,663	188,650	$206,525
Arizona	*255,350	285,471			*255,350	*285,471
Arkansas	*303,030	*402,527	*3,940	*4,143	491,840	676,467
California	7,319,320	6,460,561	*996,090	*773,034	*8,275,980	*7,188,609
Colorado	181,760	129,409	183,790	37,101	365,550	166,510
Connecticut	*2,224,590	*2,510,763	295,080	295,118	*2,519,670	*2,805,881
Delaware	(†)	(†)			(†)	(†)
Florida	1,728,530	1,260,293	284,560	267,654	2,013,090	1,527,947
Georgia	596,840	615,510	57,440	52,453	654,280	667,963
Hawaii	349,980	615,227	1,400	2,557	351,380	617,784
Idaho	204,020	221,700	17,800	3,565	221,820	225,265
Illinois	5,389,000	4,255,550	936,240	724,302	6,325,240	4,979,852
Indiana	3,033,890	2,748,016	467,490	415,096	3,501,380	3,163,112
Iowa	1,158,490	1,182,773	107,390	45,809	1,265,880	1,228,582
Kansas	805,530	848,369	520,490	460,329	1,326,020	1,308,698
Kentucky	1,414,860	1,586,340	825,670	606,508	2,240,530	2,192,848
Louisiana	(†)	(†)	(†)	(†)	(†)	(†)
Maine	64,870	133,764			64,870	133,764
Maryland	*710,230	*1,002,732	*82,800	*116,992	992,090	1,402,783
Massachusetts	*2,402,610	*3,249,882	363,980	369,642	*2,766,590	*3,619,524
Michigan	*2,229,870	*1,398,603	239,910	158,554	*2,469,780	*1,557,157
Minnesota	317,170	345,229			317,170	345,229
Mississippi	(†)	(†)	(†)	(†)	(†)	(†)
Missouri	*2,280,940	*2,875,012	214,040	193,952	*2,494,980	*3,068,964
Montana	32,720	32,391	2,630	735	35,350	33,126
Nebraska	76,060	80,677	(†)	(†)	*76,060	*80,677
New Hampshire	*54,520	*73,975			*54,520	*73,975
New Jersey	*2,283,310	*3,455,137	217,610	255,185	*2,500,920	*3,710,322
New Mexico	*20,930	*21,193	(†)	(†)	400,090	217,552
New York	10,148,050	13,489,699	887,770	783,049	11,035,820	14,272,748
North Carolina	*1,275,930	*1,651,623	114,150	114,448	*1,390,080	*1,766,071
Ohio	7,742,080	6,641,627	2,449,490	2,008,343	10,191,570	8,649,970
Oklahoma	*1,467,550	*1,228,128	552,760	270,548	*2,020,310	*1,498,676
Oregon	1,350,950	1,219,043	14,700	19,000	1,365,650	1,238,043
Pennsylvania	6,862,940	8,106,536	1,021,610	1,244,091	7,884,550	9,350,627
Porto Rico	36,110	49,133	70	129	36,180	49,262
Rhode Island	131,530	223,769			131,530	223,769
South Carolina	948,150	1,262,740	77,720	76,096	1,025,870	1,338,836
South Dakota	209,800	283,868			209,800	283,868
Tennessee	1,067,270	1,127,167	973,270	763,495	2,040,540	1,890,662
Texas	2,061,910	1,705,000	1,388,770	940,747	3,450,680	2,645,747
Vermont	*66,740	*99,106	1,360	1,558	*68,100	*100,664
Virginia	*1,187,720	*1,151,557	1,696,140	1,531,082	*2,883,860	*2,682,639
Washington	1,401,450	1,540,548	78,750	53,009	1,480,200	1,593,557
West Virginia	644,700	653,706	564,220	399,145	1,208,920	1,052,851
Wisconsin	*3,235,260	*3,253,852	*62,980	*51,003	3,438,890	3,406,577
Wyoming	(†)	(†)	(†)	(†)	(†)	(†)
Undistributed	805,500	1,055,425	748,440	609,250	689,630	858,725
	76,174,770	$80,685,493	16,546,490	$13,702,385	92,721,260	$94,387,878

*To avoid disclosing confidential information certain totals are somewhat incomplete, the figures not included being combined under "Undistributed." †Included under "Undistributed."

Fluxing Stone

Stone sold for fluxing to blast furnaces, open-hearth steel works, smelters and other metallurgical plants amounted to 24,393,500 short tons, valued at $18,034,910, an increase of 5% in quantity and 6% in value.

Refractory Stone

Stone reported for refractory use, which includes dolomite, quartzite and mica schist, amounted to 1,558,200 short tons, valued at $1,807,324, in 1929, an increase in quantity of 15.5%. Raw dolomite reported as sold for the manufacture of refractories in 1929 amounted to 516,400 short tons, valued at $461,444. Besides this quantity, operators who both quarry and dead-burn or sinter dolomite reported 488,032 tons of sintered material, valued at $4,261,942. The quantity of raw dolomite reported was 1% less than in 1928, and the sintered material increased 9%. Quartzite (ganister) used in the manufacture of refractory brick, for furnace lining, and for the manufacture of ferrosilicon, amounted to 1,004,400 short tons, valued at $1,200,634. This was an increase of 3% in quantity. Sales of mica schist for furnace and kiln lining amounted to 37,400 tons, valued at $145,246, an increase in quantity of 10%.

Sales in 1929 of pulverized limestone for agricultural use amounted to 2,654,580 tons, valued at $3,764,775, an increase of 21% in quantity over the sales for 1928.

The total quantity of stone for manufacturing industries and "other uses" showed a large increase in 1929 over 1928. This was due to increased use of stone for some of the chief chemicals which use limestone in their manufacturing processes and also due to local conditions influencing the demand for stone for "other uses."

The accompanying tables show the sales of stone in 1929 by kinds and by uses and the corresponding sales for 1928 for comparison.

Canadian Investigations in Ore Dressing and Metallurgy

THE 1928 annual report of investigations in ore dressing and metallurgy has been issued by the Mines Branch of the Department of Mines, Ottawa, Canada. This report is known as No. 711 and comprises six sections as follows:

I. General review of investigations.
II. Investigations of ore dressing and metallurgical laboratories.
III. Investigations of nonmetallics laboratory.
IV. Investigations of hydrometallurgical laboratory.
Report on the treatment of mixed concentrates from base metal sulphide ores.
V. Investigations and work of the chemical laboratories.
VI. The new pyrometallurgical laboratory of the Department of Mines.

Illinois Farmers Using Much Limestone

A LARGE TONNAGE of agricultural limestone will be spread on Illinois farms to neutralize acid soils in 1930 in spite of the financial depression and drought conditions, according to quarry operators who met recently with representatives of the Illinois Agricultural Association.

While there will be some recession from the record year of 1929 when approximately 925,000 tons of limestone were spread on Illinois farms, the producers state that the volume of sales this year has held up well. The quarry operators reported a heavy falling off in orders for concrete stone and sizes other than agricultural, however. As a result the supply of farm limestone which is a byproduct in the manufacture of other stone, is lower than usual and the quarry men are not disposed to cut prices.

The extension of credit to farmers for purchasing limestone was considered at the recent meeting. It was generally agreed that this matter should be left largely to the local banker with the recommendation that he go as far and safely as he possibly can in lending money to buy this needed soil builder.

Farmers should continue their crop rotation systems with the use of limestone, rock phosphate, and legumes even if it means extraordinary effort and sacrifice, according to J. R. Bent, director of the limestone-phosphate department for the I. A. A. With the stimulation of agricultural production throughout the world, the necessity for higher yields per acre with consequent lower cost production becomes more apparent each day. Recent advice from the Federal Farm Board is that wheat acreage be cut so as to supply only domestic needs since other countries are able to produce wheat cheaper than most United States wheat growers.

Farm Adviser Charles H. Keltner of the Winnebago County Farm Bureau, states that the farmer who pays strict attention to improving soil fertility and increasing yields per acre will be in the best position to make a profit from his farming operations regardless of what happens in the future.—*Rockford* (Ill.) *Gazette.*

Inland Plant Nearly Ready

THE INLAND LIME AND STONE CO.'s plant at Port Inland, Schoolcraft county, near Manistique, Mich., is nearing completion and shipments of rock are expected to begin in October, according to a statement made by officials of the company to the *Pioneer-Tribune* of Manistique. The quarries of the company are located in Newton township, Mackinac county, and the operations of the company will mean much to the prosperity of the west end. The *Tribune* says:

"Clarence B. Randall, vice-president of the Inland Lime and Stone Co., and Wm. Sykes, chief engineer, visited the operations recently and expressed approval at the rapid progress which is being made in the construction work. The Merrit Chapman and Scott Corp. has entirely completed its work on building the breakwater and dock. All of the other contracts are progressing nicely and some of the largest machinery is to be installed soon.

"The rapidity with which the work has been carried on this summer, has not only been a source of satisfaction to the company officials, but is also gratifying to local residents who have been keenly interested in the development. The operations at Port Inland have meant much to Manistique and Schoolcraft county and will continue to mean much in the future."

Wisconsin Granite Producer Adds Crushing Plant

EXTENSIVE improvements are being made at the quarry of the American Black Granite Co., just east of the city limits of Mellen, Wis. New machinery, buildings and concrete work is being installed at a cost of nearly $75,000.

Some time ago the crew of the quarry began excavating and making forms for the concrete work of the rock crusher and recently a contract was let by A. E. Appleyard, general manager, to Bystrom Bros. of Ashland, concrete contractors, for the work. At the same time the contract was let to Roy Murphy of Ashland for the buildings and wood work in connection with the rock crusher to house the machinery. These contracts are to go ahead at once.

The installation of the crusher machinery, which has been on the grounds for a year, will greatly eliminate the accumulation of waste rock that takes up valuable space and the converting of this waste rock into crushed rock for commercial purposes gives the company a very profitable by-product.—*Ironwood* (Mich.) *Globe.*

Cement Men Protest Coal Rates

FURTHER PROTEST of rates on bituminous coal from mines in West Virginia to destinations in eastern Pennsylvania and New Jersey, similar to those in the central Pennsylvania coal producers' complaint, was received recently by the Interstate Commerce Commission from a group of portland cement manufacturers in the "Lehigh portland cement district."

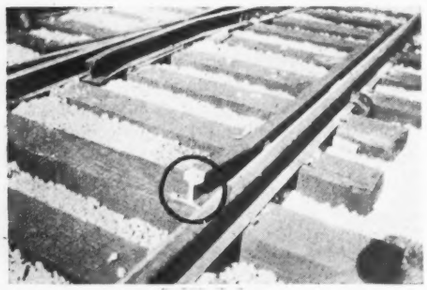
In a brief filed with the commission, the cement makers charged the Reading Co. with violation of Section 1 of the Interstate Commerce Act, maintaining "rates that are unjust, unreasonable and excessive."

Hearing on the central Pennsylvania case has been suspended until November 3. There is a possibility the complaint against the Reading may then be included with those against the Pennsylvania, Baltimore & Ohio and other coal carrying railroads operating in Pennsylvania.

Hints and Helps for Superintendents

A Safety Suggestion

THERE is always danger of a serious accident when men are working around the railroad tracks of an industrial plant since the worker might be crushed under a car if he should happen to trip, and even if the possible accident were no more serious than a few bruises or sprained muscles, it certainly should be worth while to take every precaution to see that the men are protected against such accidents. The Elmhurst-Chicago Stone Co., Elmhurst, Ill., has taken a step in this direction by painting the ends of all guard rails on their trackage a clear *white*. This color stands out distinctly and serves to call the men's attention to the projecting rail. The guard rails are particularly dangerous, since men running along the straight rail to switch a car might easily overlook them. When called to their attention by the white ends the men will not trip



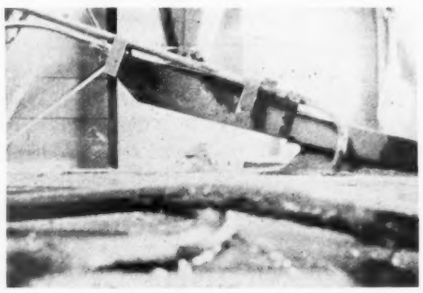
The ends of the guard rails are painted white for safety

over the rail, nor will they get their feet caught between the guard rail and the track rail, as sometimes occurs, causing painful and often serious accidents. As an added precaution against the latter accident a block of wood can be driven between the guard rail and the other rail so that there is no chance for a man to get so caught. This is frequently done in railway switch yards as a safety measure.

Device for Shunting Material to an Adjoining Bin

THERE are many means of changing the flow of material in chutes so that one or another bin can be filled. An ingenius arrangement was noted recently at the plant of Henry Jaeger, near Milwaukee, Wis., and is shown in the accompanying illustration. This device was underneath a sand cone and permitted the material to pass directly to the bin below or to be shunted to another bin as desired.

The device consists of a pair of iron pipes curved at both ends so that the ends rest vertically on the flooring around the top of the bin, while the center portion crosses directly over the bin at an inclination as shown. Upon this "track" a home-made trough is hung by strap iron hooks, thus



Sliding arrangement under sand cone to permit shifting of sand to bins

making it possible to move the trough under the discharge of the sand cone or to slide it up out of the way entirely. The trough is open at the lower end, and when in position under the cone its lower end butts against the upper end of another chute which carries the discharge to the adjoining bin. When pulled back to the far end of the track the sand does not touch the sliding trough but drops directly to the bin beneath.

Bridge Over a Belt Conveyor

WHEN it is necessary to cross from one side of a belt conveyor to the other the usual arrangement is some sort of a bridge with steps leading up to each end. A bridge which is just as easy to construct and much more convenient to use is illustrated here. It consists simply of a regular bridge across the belt which extends a little beyond the sides of the belt, and to these extending ends are fastened planks which slope gradually down to the walkway on either side. One plank is laid toward the upper end of the belt and one plank toward the feed end on each side, thus making four planks necessary. Thus it is possible to use this crossing from any direction, and since it is not necessary to use steps, a man can get to the other side much more rapidly and with greater

Simple bridge constructed over belt conveyor

safety than by the older type of bridge. This type is only recommended where the slope on the conveyor is not great. The one illustrated is on the pit conveyor at the Silver Lake plant of the Kenosha Sand and Gravel Co., Kenosha, Wis.

Methods for Quickly Removing Old Flues

By F. J. MacDonald
Beacon, N. Y.

AT MANY INDUSTRIAL PLANTS the old reliable steam power is still used. Many shovel men will tell you that for flexibility and long hard service it cannot be beat. For stationary work and long hard service the wonderful Corliss type engine as a prime mover is hard to beat. At the place I worked last year an old man over 60 told me that the same nice smooth running 50-hp. Corliss engine was running there when he was a little boy, and it is still in daily operation. How does your high speed internal combustion engine compare with such durability?

For convenience and intermittent service they are fine, but too soon require a general overhauling. Like the grandfather's clock (that stood in the hall) and went tick—tick—tick, only every second, perhaps has run 100 years and good for another century, compared with the little modern clock that goes tick, tick as fast as it can and in a year or two lands in the scrap heap. The race horse cannot do draft horse duty and vice versa.

The reader may begin to wonder where the boiler talk is. Sometimes it is necessary to beat around the bush to scare out the rabbit.

Of course where steam is used the boiler is always essential. How fine they steam

when new and clean! How long they last depends greatly upon the water used and the care, but the time finally arrives when reflueing is necessary. A few leaky flues sometimes can be plugged with suitable cast plugs and a rod through them. It is rather against the rules, but in case of necessity to tide over rush orders, or until a suitable time for a reflueing job it may be necessary. The object of this article is to tell you how to quickly remove the old flues.

"*Burn* them out; why, how dare you do it?" Some back number boiler owner will say, "No, no, you can't burn out any flues for me, you will injure the sheet."

Very well, listen; not so long ago it fell to my lot to remove the tubes from a Buffalo Pitts road roller. We tried the cutting process. The boiler had been used with hard water and the flues were well coated with scale. After spending an hour cutting—by hand drive and the loss of much preparation, we decided to try the burning process.

The smokestack end had a hand hole down at the bottom of the flue sheet. We removed it, cut all the flues on the front end by running the cutting torch around in the open end of the flue, cutting it off, say, ¾ in. back of the tube sheet.

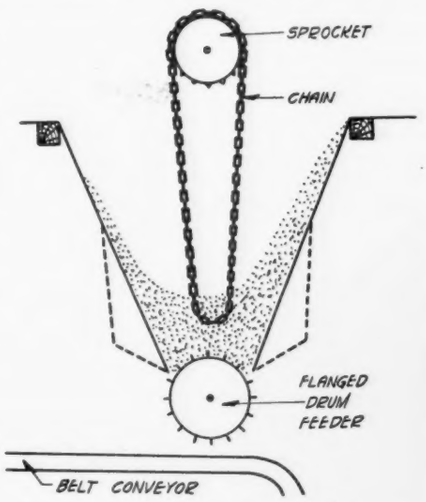
It is not necessary to cut the other end, only the head and start them with a blunt half round chisel. They were all cut and dropped down in much less than half a day and all pulled out through the hand hole. This merely is another labor-saving method. Is it right for me to describe it? Many think that so many labor-saving methods are the cause of the unemployment condition. Times have changed. The public demands quick methods. Years ago the farmer went to the mill and many times the water was low or frozen over. The farmer was in no hurry; next week or next month would do. Today the question is, how soon can you do my job? I must have it right away. If you cannot do it at once, I will have to take it to the next man. The public demands quick modern methods.

A few days ago I was sent out on a boiler job. The case was a Buffalo Ohio 10-ton steam roller with 129, 1½-in. prossored flues to remove. (They did not want to tip the boiler down.) The young man sent with me was a practical boiler man with several years experience. He started in with the hand tools for cutting out and over one-half hour was spent taking out one flue. At this rate it would take at least five days with two men and plenty of hard work.

I suggested we cut them out, but he had never seen it done. We clipped off the 1½-in. steam pipe, removed the stub, which left a hole about 2 in. in diameter. We cut the flues on the top end sometimes as fast as two per minute. (If extremely rusty pick some of it off to facilitate burning, cut a hole in each flue to hook a wire in and cut the heads at the bottom either with a sharp cold chisel or the torch.) If you are sure in handling it, swing them all over at the top and pull them up through the steam pipe hole. In less than one day we had them all out. Saving in labor, four days work with two men. For the benefit of a few I will say that a prossored flue is a flue with a ridge or enlargement rolled in it just inside of the tube sheet. This is supposed to make a tighter and firmer job. They surely are tight all right if you attempt to remove them with the ordinary hand method. I especially recommend a fine working No. 1 cutting torch for boiler tube work. For good boiler tools the splitting chisel should be a fairly good length (10 to 12 in. with a blade at least 3 in. long and at least 3/16 in. thick); thinner back (like a good cross-cut saw) with a gradual taper and wider at the point than anywhere else. If the point is ground just right, the circle in drawing the chip when cutting can be turned inside of the flue instead of outside, making the flue much easier to drive out. Sometimes it is best to split a prossored flue in two places, back 3 in. from the end.

To Prevent Sand from Bridging in Feed Hopper?

A READER tells us he has a problem he has been unable to solve, and wants some suggestions. The problem is in connection with feeding a sand and gravel plant from an open hopper. The material comes from a bank deposit and runs 97% sand and 3% gravel from ¼ to 5 in. This is brought up by a drag scraper bucket which dumps into the open hopper.



Cross-section of the hopper with suggested rotating chain

The material drops into the open hopper on a flanged drum feeder, which feeds a steady flow to the belt conveyor below. This feeder works splendidly for the purpose of regulating the flow to the belt, but it does not prevent the material from bridging in the hopper, so it is necessary to have a man at the hopper with a rod or poker to keep the material moving in the hopper.

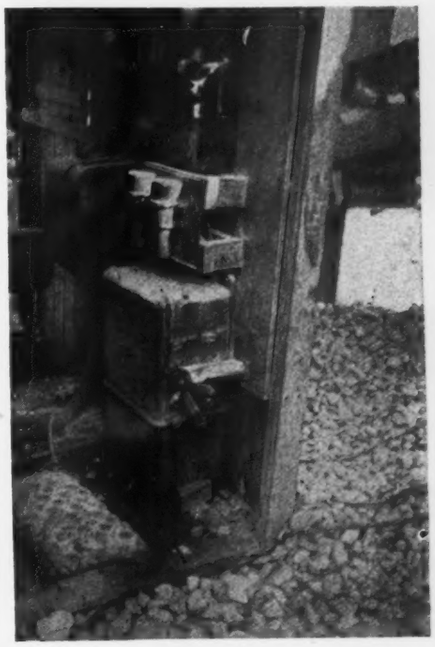
The question the reader proposes for us (and you) to answer is: Do you know of any kind of an agitator or propeller which will keep the sand from bridging, so that it will flow naturally by gravity to the drum feeder? The sand seems to bridge irrespective of weather conditions (wet or dry). The reader has thought of installing a rotating chain in this hopper and of various other things which might work, but as a check he would like to hear of others' experience.

The accompanying illustration shows a cross-section of the hopper and the reader's suggestion of a rotating chain. The editors have suggested changing the slope of the sides of the hopper, somewhat as shown in the dotted lines. It is believed that if the sides are made steep enough the bridging can be avoided. However, it is recognized that the material may accumulate in the corners of the hopper and stand at a sufficient slope to provide a foothold for the haunches of the arch.

Any reader having experience in preventing such arching is invited to drop the editors a line. There is a $5 bank note due the writer of every practical suggestion.

A Safety-First Electrical Precaution

A PIECE of old truck tire stretched out and spiked to the floor directly in front of an electrical switch box forms an excellent non-conductor mat and may prevent a serious shock to a man pulling the switch. When the rubber is placed in this position a man naturally stands on it without even having to think about it as he pulls the switch and so is automatically safeguarded. In this installation the switch handles were wound with friction tape as an added precaution.



A piece of old truck tire serves as a non-conductor mat

Charles M. Doolittle Honored at Home and Abroad for His Rise in Business World

THE OLD SAYING that a prophet (meaning a great man) is not without honor save in his own home town, seems disproved in the case of C. M. Doolittle, president of the Canada Crushed Stone Corp., Ltd., Hamilton, Ont. The following is from his original home-town newspaper, the *Painesville* (Ohio) *Telegraph*:

"Charles Marshall Doolittle, son of C. E. Doolittle, and formerly of Painesville, figured prominently on the front page of the *Hamilton* (Ontario) *Herald* for Saturday, September 6, when a story of his life and achievements, along with a photograph, was published by the Canadian paper. Among relatives of Mr. Doolittle now residing in Painesville are: H. Marshall Doolittle, an uncle; Mrs. C. C. Paige, an aunt; and Mrs. I. K. Pierson, an aunt. Quoting from the Ontario newspaper:

"Although born on the other side of the border, 51 years spent in various occupations in this city may almost entitle Charles Marshall, president and general manager of the Canada Crushed Stone Corp., Ltd., and subsidiary companies, Sun Life building, to be called a Hamilton man.

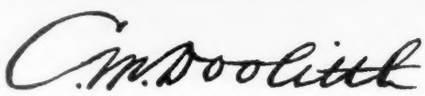
"Born on September 2, 1876, at Painesville, Ohio, the son of C. E. Doolittle, he comes to Hamilton as a boy of three years. His father was the president of the Ontario Rolling Mill Co., and came to be regarded as one of the pioneer iron and steel men of Canada, his organization being largely esponsible ultimately for the Steel Co. of Canada.

"Mr. Doolittle was educated at Deveux college, Niagara Falls, N. Y., and later proceeded to Queen's university, Kingston, where he took up the study of mining engineer. This study he found a fascinating pursuit, which he was destined to turn to good account in later years.

"In 1904 he started to quarry stone at Rymal, Ont., in company with H. E. Wilcox, and the next year, 1905, the Dundas property was acquired and the undertaking inaugurated there. From this comparatively small beginning, with an output of no more than about 25,000 tons of crushed stone yearly, has grown the Canada Crushed stone Corp., Ltd., with quarries at Hagersville, Vinemout, Puslinch and Queenstown, as well as Dundas, which boasts the largest individual capacity in crushed stone in Canada, the total yearly output of the corporation's properties now exceeding one million tons.

"The crushed stone manufactured by the corporation is distributed over fully a hundred miles and is in great demand for concrete aggregate, road building and fluxing. In 1925 the Queenstown quarry was acquired, and from there is shipped the famous Queenstown limestone, recognized as the premier building stone in the Dominion. Other products of the corporation are sand, builders' supplies, etc.

"In addition to being president and general manager of the Canada Crushed Stone Corp., Ltd., Mr. Doolittle is also president of Queenstown Quarries, Ltd., and Puslinch Quarry, Ltd. He is a conservative in politics, a director of the Hamilton Club, the Thistle club and the Dundas Valley Golf and Country club, member of the Hamilton Golf and Country club, the Granite club, (Toronto), the Engineers' club (Toronto), governor of Hillfield school, Hamilton, and



regional vice-president of the National Crushed Stone Association.

"Mr. Doolittle has been an enthusiastic curler all his life, and has lately taken up golfing. He is an Anglican in religion and is a member of the Church of the Ascension. In 1907 he married Miss Marie E. Wylie, a charming and talented lady, and has a family of three girls and two boys."

Cement Trade in Italy

AT PRESENT THERE ARE 150 cement plants in Italy, representing a capital of more than a billion lira. (Recent quotations on the lira are 5c.) Approximately 600 kilns are in operation, employing 25,000 workers. Production capacity is about 38,000,000 quintals (220 lb.). Actual production is 35,000,000 quintals, of which about 65% is natural portland cement and 35% artificial; 2,000,000 quintals blast-furnace cement; 800,000 quintals pozzolana; 50,000 quintals fused cement.

Los Angeles Finds Legitimate Method of Limiting Growth of Mushroom Gravel Plants

UPHOLDING the constitutionality of the ordinance compelling rock-crusher operators to obtain licenses from the Board of Supervisors, Los Angeles county, California, Superior Judge Bishop has discharged a writ of habeas corpus sued out by L. F. De Harporte. The petitioner was arrested, charged with establishing and operating without a license a rock-crushing plant within one-half mile of a public highway, within one-half mile of a human habitation and within one mile of a wash.

It was stipulated that the sole issue was the constitutionality of the ordinance. This ordinance prohibits the establishment of a rock crusher within the limits defined by the complaint and also adds that no license shall be issued except upon approval of the supervisors after due notice and hearing.

While recognizing rock crushing as a legitimate, necessary business, Judge Bishop held in his opinion that the ordinance is constitutionally sound and that the public officials must be presumed to be exercising their powers honestly. It is further to be presumed, he adds, that the supervisors are satisfied that plants already in existence are not menacing public welfare. He wrote:

"The power possessed by the Board of Supervisors is to be exercised on behalf of the public welfare. The court should not presume, in the absence of any facts, that the board is going to or has acted unfairly or so as to perpetuate a monopoly. If and when such facts are presented, the court will use its power to prevent oppression. No such facts are before me. The ordinance itself is not an invalid exercise of the police power. The writ should be discharged and the petitioner remanded."—*Los Angeles* (Calif.) *Times*.

Algerian Rock Phosphate to Be Exploited

RIGHTS TO EXPLOIT a mountain of phosphate, containing beds believed to be the largest and richest in the world, have been granted to an Algerian company after 30 years of opposition by Algeria.

The beds are in the Djebel-Onk mountain and are composed of almost pure phosphates. Algerians had opposed their exploitation unless the phosphates could be shipped to an Algerian port, which was much more expensive than shipping via a Tunisian port. The government finally relented and granted the concessions.

Experts estimate that the area contains at least 1,000,000,000 tons of phosphate, with phosphate content as high as 72% B. P. L.

When the beds are in active production, France will be in a major position in the phosphate market of the world, as the Djebel-Onk deposits are in French North African territory.

Editorial Comment

OUR PLATFORM

¶ Greater Economy of Production; the Best in Machinery, Control Equipment; High Wages; Perfect Co-ordination. ¶ Comprehensive Organization of Industry for Research, Promotion. ¶ Retirement of the State from Competition with Private Business. ¶ Active Participation of Business Men in the Business of Government. ¶ The Promotion of Safety and Welfare of the Industry's Employes.

We Embark on a New Enterprise!

The publishers of Rock Products have purchased, and beginning with the October number, will issue the journal *Concrete Products,* founded in Chicago in 1918. We think this announcement is worthy of editorial mention in these columns because one of the chief reasons for our new acquisition was to help round out the service of Rock Products to the cement and aggregate industries. To be brief (and modest!), while we have always aimed to try to promote the use of these products, we have had to go about it through efforts to educate producers to help themselves. Now we have the opportunity specifically to serve some of the customers of cement and aggregate producers, hoping through our efforts to be instrumental in expanding the consumption of concrete products, and thus the demand for cement and aggregates.

The Cement Products section of Rock Products will continue, for we believe cement and aggregate producers should be kept posted through this journal on the progress and development of the products industry. And we believe that a large part of the concrete products industry of the future will be in the hands of producers of cement and aggregates. These producers of concrete-making materials should be most capable of putting them together to make acceptable and marketable concrete products, as well as having the advantage of low cost raw materials.

The concrete products industry has grown from nothing, fifteen or twenty years ago, to one which now consumes about 10% of the entire production of portland cement in this country. Probably 10,000,000 to 12,000,000 tons of sand, gravel and crushed stone are used annually in the making of concrete products. There are probably about 2500 products plants, or more, of sufficient size to be respectable customers of cement and aggregate producers.

Naturally, we believe there is a real future to the concrete products industry, particularly as more and more emphasis is placed on fireproof, or at least fire-resisting, residential construction. And not only are there tremendous, avoidable, annual fire losses, but it is entirely possible and feasible to avoid both property losses, and loss of life and limb from tornadoes and earthquakes through the use of building products made of concrete. Sometime, and we hope in the near future, producers of cement, aggregates, and all the products made from them, will present a united front in promoting the use of concrete for buildings.

Promoters of concrete for residential building construction will not only be helping themselves, but they will be helping humanity by making human habitations more sanitary, safer, more permanent and in the end, taking all these into consideration, we are sure they will be making them cheaper than the "wooden balloon" houses of present and past generations. We hope we shall all live to see the day when we will look back on our wooden-balloon house dwellers with the same sympathy for their lack of understanding that we now regard our remote ancestors who dwelt in even less substantial skin and cloth tents.

So, gentlemen, we are going to contribute to the cause with *Concrete Products,* and we are certain that we can count upon you for the same generous help and encouragement that we have had in making Rock Products worthy of the industries it serves.

Cost Studies of Operations

Elsewhere in this issue is the first of a series of reports on the nonmetallic (rock products) industries by consulting engineers of the United States Bureau of Mines, published originally by the Bureau of Mines as "Information Circulars." These consulting engineers of the Bureau of Mines are practical operating men and executives in the organizations they report upon. They are employed by the Bureau of Mines for this specific purpose. In this way the Bureau of Mines has been able to elicit and make public some of the most valuable contributions thus far made to the useful literature of mining. H. D. Baylor's report, reprinted in this issue, is the first of a considerable series on the operations of quarries, gravel pits, lime, cement and gypsum plants.

The editors of Rock Products wish to openly congratulate the engineers of the United States Bureau of Mines on their achievement in getting men like Mr. Baylor to contribute reports such as his is. Naturally, we have always been advocates of publicity regarding methods and costs, believing firmly that no real progress is made in any engineering industry except through the free exchange of technical information. Engineers, almost without exception, recognize their indebtedness to past and present members of the profession for the entire literature of engineering practice, without which they would be practically helpless. We are glad that this engineering or technical point of view is now so widely accepted in our industries, through the help of the Bureau of Mines.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	9-23-30	95	99	
Alpha P. C. new com.[2]	9-22-30	24	25½	50c qu. Oct. 25
Alpha P. C. pfd.[2]	9-22-30	118	.....	1.75 qu. Mar. 15
American Aggregates com.	9-23-30	14	17	75c qu. Mar. 1
Am. Aggr. 6's, bonds	9-24-30	80⅞	.....	
American Brick Co., sand-lime brick	6-27-30	.....	5	25c qu. Feb. 1
American Brick Co. pfd.	9-22-30	61½	70	50c qu. May 1
Am. L. & S. 1st 7's[29]	9-23-30	97	98	
American Silica Corp. 6½'s[19]	9-24-30	No market		
Arundel Corp. new com.	9-22-30	43¼	43½	75c qu. Oct. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	9-24-30	.....	50	
Beaver P. C. 1st 7's[20]	9-18-30	95	99	
Bessemer L. & C. Class A	9-22-30	29	31	75c qu. Aug. 1
Bessemer L. & C. 1st 6½'s[4]	9-19-30	95	97	
Bloomington Limestone 6's[29]	9-23-30	72	75	
Boston S. & G. new com.[47]	9-20-30	16	20	40c qu. Apr. 1
Boston S. & G. new 7% pfd.[47]	9-20-30	46	50	87½c qu. Apr. 1
California Art Tile A	9-18-30	.....	8	43¾c qu. Mar. 31
California Art Tile B[50]	9-18-30	.....	6	20c qu. Mar. 31
Calaveras Cement com.	9-18-30	.....	12	
Calaveras Cement 7% pfd.	9-18-30	.....	88	1.75 qu. July 15
Canada Cement com.	9-22-30	.....	18½	
Canada Cement pfd.	9-22-30	94	95	1.62½ qu. Sept. 30
Canada Cement 5½'s[43]	9-19-30	100¼	100¾	
Canada Cr. St. Corp. bonds[43]	9-19-30	94¾	97	
Certainteed Prod. com.	9-23-30	6	6½	
Certainteed Prod. pfd.	9-23-30	20	25	1.75 qu. Jan. 1
Cleveland Quarries	9-22-30	65	75	75c qu. 25c ex. Sept. 1
Columbia S. & G. pfd.	9-23-30	91¼	95	
Consol. Cement 1st 6½'s, A	9-24-30	70	80	
Consol. Cement. 6½% notes	9-24-30	60	65	
Consol. Cement pfd.[29]	9-23-30	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	9-19-30	99	101	
Consol. Rock Prod. com.[44]	9-18-30	1¾	2¼	
Consol. Rock Prod. pfd.[44]	9-18-30	8½	9½	43¾c qu. June 1
Consol. Rock Prod. units	9-18-30	17	21	
Consol. S. & G. pfd. (Can.)	9-22-30	84	86	1.75 qu. Aug. 15
Construction Mat. com.	9-22-30	13	14	
Construction Mat. pfd.	9-23-30	40	41	87½c qu. Aug. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	9-19-30	88	93	
Coosa P. C. 1st 6's[29]	9-23-30	50	55	
Coplay Cem. Mfg. 1st 6's[40]	9-22-30	95	.....	
Coplay Cem. Mfg. com.[40]	9-22-30	10	.....	
Coplay Cem. Mfg. pfd.[40]	9-22-30	60	.....	
Dewey P. C. 6's (1930)[30]	9-24-30	99	.....	
Dewey P. C. 6's (1931-41)[30]	9-24-30	99	.....	
Dolese & Shepard	9-23-30	75	80	$2 qu. July 1
Dufferin Pav. & Cr. Stone com.	9-22-30	.....	17	
Dufferin Pav. & Cr. Stone pfd.	9-22-30	85	.....	1.75 qu. Oct. 1
Edison P. C. com.[39]	9-19-30	10c	.....	
Edison P. C. pfd.[39]	9-19-30	25c	.....	
Giant P. C. com.[2]	9-22-30	5	15	
Giant P. C. pfd.[2]	9-22-30	15	30	1.75 s.-a. June 16
Gyp. Lime & Alabastine, Ltd.	9-22-30	18	18¼	37½c qu. Oct. 1
Hermitage Cement com.[11]	9-20-30	30	35	
Hermitage Cement pfd.[11]	9-20-30	87	91	
Ideal Cement, new com.	9-23-30	49	51	75c qu. Oct. 1
Ideal Cement 5's, 1943[33]	9-22-30	99¾	.....	
Indiana Limestone units[29]	9-23-30	.....	90	
Indiana Limestone 6's	9-23-30	70	71⅛	
International Cem. com.	9-23-30	63⅛	64	$1 qu. Sept. 30
International Cem. bonds 5's	9-23-30	100¼	.....	Semi-ann. int.
Iron City S. & G. bonds 6's[46]	9-19-30	90	.....	
Kelley Is. L. & T. new stock	9-22-30	36½	49	62½c qu. Oct. 1
Ky. Cons. St. com. V.T.C.[48]	9-18-30	8½	10	
Ky. Cons. Stone 6½'s[48]	9-18-30	93	95	
Ky. Cons. Stone pfd.[48]	9-18-30	87	90	1.75 qu. Aug. 1
Ky. Cons. Stone com.[48]	9-18-30	8½	10	
Ky. Rock Asphalt com.[11]	9-20-30	14	16½	40c qu. Oct. 1
Ky. Rock Asphalt pfd.[11]	9-20-30	76	80	1.75 qu. Sept. 1
Ky. Rock Asphalt 6½'s[11]	9-20-30	90	100	
Lawrence P. C.[2]	9-22-30	64	.....	$1 qu. June 28
Lawrence P. C. 5½'s, 1942[2]	9-22-30	86½	89	
Lehigh P. C.	9-23-30	23	30	25c qu. Nov. 1
Lehigh P. C. pfd.	9-23-30	105⅛	107	1¾% qu. Oct. 1
Louisville Cement[48]	9-22-30	250	.....	
Lyman-Richey 1st 6's, 1932[13]	9-22-30	97	99	
Lyman-Richey 1st 6's, 1935[13]	9-22-30	97	99	
Marblehead Lime 6's[11]	9-19-30	85	95	
Marbelite Corp. com. (cement products)	9-20-30	200	.....	
Marbelite Corp. pfd.	9-20-30	12	.....	50c qu. July 10
Material Service Corp.	9-20-30	19	.....	50c qu. Sept. 1
McCrady-Rogers 7% pfd.[22]	9-19-30	55	.....	
McCrady-Rogers com.[22]	9-19-30	15	20	
Medusa Portland Cement	9-23-30	90	95	1.50 July 1
Mich. L. & C. com.[6]	9-22-30	25	.....	
Missouri P. C.	9-23-30	30	31	50c qu. Aug. 1
Monolith Portland Midwest[9]	9-18-30	2½	3½	
Monolith bonds, 6's[9]	9-18-30	80	85	
Monolith P. C. com.	9-18-30	4½	5½	40c s.-a. Jan. 1
Monolith P. C. pfd.	9-18-30	3½	4½	40c s.-a. Jan. 1
Monolith P. C. units[9]	9-18-30	12½	15	
National Cem. (Can.) 1st 7's[43]	9-19-30	99½	100	
National Gypsum A com.	9-23-30	4	6	
National Gypsum pfd.	9-23-30	26	29	
Nazareth Cement com.[26]	9-19-30	22	.....	
Nazareth Cement pfd.[26]	9-19-30	100	.....	
Newaygo P. C. 1st 6½'s[29]	9-23-30	101¼	.....	
New Eng. Lime 1st 6's[14]	9-19-30	No market		
N. Y. Trap Rock 1st 6's	9-23-30	102	102¼	
N. Y. Trap Rock 7% pfd.[36]	9-20-30	95	.....	1.75 qu. Apr. 1
North Amer. Cem. 1st 6½'s	9-19-30	57	60	
North Amer. Cem. com.[29]	9-23-30	4	7	
North Amer. Cem. 7% pfd.[29]	9-23-30	20	24	
North Amer. Cem. units[29]	9-23-30	24	30	
North Shore Mat. 1st 5's[15]	9-24-30	95	.....	
Northwestern States P. C.[37]	9-20-30	115	.....	$2 Apr. 1
Ohio River Sand com.	9-22-30	15	17	
Ohio River Sand 7% pfd.	9-22-30	.....	97	
Ohio River S. & G. 6's[16]	9-22-30	90	95	
Oregon P. C. com.[20]	9-18-30	9	13	
Oregon P. C. pfd.[20]	9-18-30	90	94	
Pacific Coast Aggr. com.[50]	9-18-30	4	.....	
Pacific Coast Aggregates pfd.	9-15-30	.....	8	
Pacific Coast Cement 6's[5]	9- 2-30	75¼	76½	
Pacific P. C. com.	9-18-30	15	18	
Pacific P. C., new pfd.[9]	9-15-30	65	72	1.62½ qu. July 5
Pacific P. C. 6's[5]	9-18-30	99½	.....	
Peerless Cement com.[21]	9-22-30	7⅞	8½	
Peerless Cement pfd.[21]	9-22-30	73	78	1.75 Oct. 1
Penn.-Dixie Cement pfd.	9-23-30	40	46	
Penn.-Dixie Cement com.	9-23-30	6½	6¾	
Penn.-Dixie Cement 6's	9-23-30	85	.....	
Penn. Glass Sand Corp. 6's	9- 3-30	102½	.....	
Penn. Glass Sand pfd.	8- 6-30	105	.....	1.75 qu. Oct. 1
Petoskey P. C.	9-23-30	8½	9½	15c qu. Apr. 1
Port Stockton Cem. units[9]	2-17-30	.....	30	
Port Stockton Cem. com.[20]	9-18-30	No market		
Riverside Cement com.	9-18-30	11	14	
Riverside Cement pfd.[20]	9-18-30	74	78	1.50 qu. Aug. 1
Riverside Cement, A[20]	9-18-30	11	14	31¼c qu. Aug. 1
Riverside Cement, B[20]	9-18-30	2	.....	
Roquemore Gravel 6½'s[17]	9-22-30	99	100	
Santa Cruz P. C. 1st 6's, 1945[5]	9- 2-30	105	.....	6% annually
Santa Cruz P. C. com.	9-18-30	90	.....	$1 qu. Oct. 1
Schumacher Wallboard com.	9-18-30	9	10½	
Schumacher Wallboard pfd.	9-18-30	20	22½	50c qu. Aug. 15
Southwestern P. C. units[44]	9-18-30	240	.....	
Standard Paving & Mat. (Canada) com.	9-22-30	18	19⅞	50c qu. Aug. 15
Standard Paving & Mat. pfd.	9-22-30	85	86	1.75 qu. Aug. 15
Superior P. C., A	9-18-30	34	35⅞	27½c mo. Oct. 1
Superior P. C., B	9-18-30	11	13	25c qu. Sept. 20
Trinity P. C. units[37]	9-20-30	130	140	
Trinity P. C. com.[37]	9-20-30	30	.....	
Trinity P. C. pfd.[29]	9-23-30	105	110	
U. S. Gypsum com.	9-24-30	41½	42½	40c qu. Sept. 30
U. S. Gypsum pfd.	9-24-30	119	120	1.75 qu. Sept. 30
Universal G. & L. com.[3]	9-24-30	No market		
Universal G. & L. pfd.[3]	9-24-30	No market		
Universal G. & L., V.T. C.[3]	9-24-30	No market		
Universal G. & L. 1st 6's[3]	9-24-30	No market		
Warner Co. com.[16]	9-22-30	40	41	50c qu. & 25c ex. Oct. 15
Warner Co. 1st 7% pfd.[16]	9-22-30	100	101	1.75 qu. Oct. 1
Warner Co. 1st 6's	9-24-30	97½	100	
Whitehall Cem. Mfg. com.[36]	9-20-30	80	.....	
Whitehall Cem. Mfg. pfd.[36]	9-20-30	50	.....	
Wisconsin L. & C. 1st 6's[15]	9-24-30	95	.....	
Wolverine P. C. com.	9-23-30	3⅞	4½	15c qu. Aug. 15
Yosemite P. C., A com.[20]	9-18-30	2	2½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler Reading & Co., Youngstown, Ohio. [5]Smith, Camp & Co., San Francisco, Calif. [6]Frederic H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simon & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [24]A. B. Leach & Co., Inc., Chicago, Ill. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [28]Bank of Republic, Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago, Ill. [33]Boettcher Newton & Co., Denver, Colo. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Los Angeles, Calif. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Wise, Hobbs & Arnold, Boston. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co., Chicago, Ill. [50]Martin Judge Co., San Francisco, Calif.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked	Stock	Price bid	Price asked
Consolidated Cement com. v.t.c., 3220 shs.[1]	1½ per share	.....	Universal Gypsum and Lime, 200 shs.[3]	$2 for the lot	.....
Universal Gypsum and Lime, 300 shs.[3]	$4 for the lot	.....	Holliston Trap Rock Co. com.,[2] 67 shs., per sh.	35	.....

[1]Price at auction by Wise, Hobbs & Arnold, Boston, Dec. 18, 1929. [2]Price at auction by R. L. Day & Co., Boston, July 16, 1930. [3]Price at auction by Adrian H. Muller & Son, New York, August 6, 1930.

Virginia-Carolina Chemical Corp. Statement

THE report of Virginia-Carolina Chemical Corp. and subsidiaries, producers and manufacturers of phosphate and other fertilizers, for year ended June 30, 1930, shows net profit of $1,407,003, after depreciation, depletion, provision for doubtful accounts and federal taxes, equivalent, after 7% prior preference dividends, to $2.63 a share earned on 213,392 shares of 6% participating preferred stock on which unpaid dividends amounted to 13% on June 30, last. This compares with $1,515,501, or $3.05 a share, on the 6% participating preferred stock in preceding fiscal year.

Consolidated income account for year ended June 30, 1930, compares as follows:

	1930	1929	1928	1927
*Gross	$3,925,182	$3,925,840	$4,848,143	$2,005,157
†General expense, etc.	2,283,268	2,130,431	2,127,041	2,128,273
Operating profit	$1,641,914	$1,795,409	$2,721,102	‡$123,116
Other income	696,289	629,688	552,150	539,169
Total income	$2,338,203	$2,425,097	$3,273,252	$416,053
Depreciation	831,200	809,596	762,550	635,906
Federal tax	100,000	100,000	.....	.....
Net profit	$1,407,003	$1,515,501	$2,510,702	‡$219,853
Preference preferred dividends	844,725	863 450	896,199	934,826
Participating preferred dividends	426,111	639,167	.....	.....
Surplus	$136,167	$12,884	$1,614,503	§$1,154,679

*After manufacturing expenses and depletion of mines. †Includes provision for doutbful accounts, etc. ‡Loss. §Deficit.

Consolidated balance sheet of Virginia-Carolina Chemical Corp. and subsidiaries as of June 30, 1930, compares as follows:

ASSETS

	1930	1929	1928	1927
*Land, buildings, machinery and equipment	$15,948,868	$16,041,534	$16,048,720	$16,185,056
Investment in allied companies	683,002	683,002	683,010	683,010
Inventories	3,901,806	4,115,671	4,250,434	3,686,275
Accounts and bills receivable	9,095,734	8,287,521	7,862,535	7,896,915
Call loans	.....	6,300,000	6,600,000	5,000,000
Cash	7,891,696	2,443,527	2,595,434	3,112,873
Miscellaneous investments	466,981	467,087	516,217	590,357
Mixed claims aw	.....	.....	.....	388,000
Prepaid insurance, etc.	105,575	119,496	88,104	96,807
Total	$38,093,662	$38,457,838	$38,644,454	$37,639,293

LIABILITIES

7% preference preferred stock	$11,760,000	$12,270,000	$12,500,000	$12,937,200
6% participating preferred stock	21,339,215	21,339,215	21,339,215	21,339,215
†Common stock	1	1	1	1
Minority interest	16,983	14,769	13,898	11,242
Accounts payable	340,657	403,640	505,805	403,615
Federal tax reserve	195,146	100,000	.....	.....
Reserve for insurance and contingencies	117,211	201,928	170,135	447,124
Surplus	4,264,449	4,128,285	4,115,400	2,500,896
Total	$38,093,662	$38,457,838	$38,644,454	$37,639,293

†Represented by 486,700 no-par shares. *Less depreciation.

Idaho Portland Cement Co. Pays Interest and Dividend

EUGENE ENLOE, president of the Idaho Portland Cement Co., recently announced that $13,000 would be disbursed by the company on September 15 in dividends and interest.

Interest and dividends are calculated from the date of the original investment by the shareholders in the property, the interest being calculated on the money put in during the period of construction and dividends from the time the plant went into production. The coming payment will bring the return to the stockholders down to the date of July 1, 1929. Another payment is expected to be made in January and eventually the dividends will be brought up to date. There is no bonded debt.

Mr. Enloe is the largest single stockholder in the company and has recently increased his holdings. He had just returned from the plant, located at Inkom, Idaho, near Pocatello.

"We have just completed improvements that cost $50,000, which were paid out of earnings," said Mr. Enloe. "The new improvements will aid in speeding up production as we have had more orders this year than we could supply. The future of the property is bright and we believe that another dividend payment to stockholders will be made in January. The stock is virtually all owned by residents of Spokane."—*Spokane* (Wash.) *Spokesman-Review.*

Recent Dividends Announced

Alpha Portland Cement com. (qu.)	0.50,	Oct. 25
Arundel Corp. (qu.)	0.75,	Oct. 1
Dufferin Pav. & Cr. Stone 1st pfd. (qu.)	1.75,	Oct. 1
Gypsum, Lime & Alabastine, Ltd. (qu.)	0.37½,	Oct. 1
Ideal Cement (qu.)	0.75,	Oct. 1
Kelley Is. Lime & Transport (qu.)	0.62½,	Oct. 1
Kentucky Rock Asphalt com. (qu.)	0.40,	Oct. 1
Santa Cruz Portland Cement com. (qu.)	$1.00,	Oct. 1
Superior Portland Cement Cl. A. (qu.)	0.27½,	Oct. 1
Superior Portland Cement Cl. B (qu.)	0.25,	Sept. 20
Lehigh Portland Cement com. (qu.)	0.25,	Nov. 1
Peerless Cement pfd. (qu.)	1.75,	Oct. 1

Financial Outlook of Rock Products Industry in California Better

FOLLOWING THE PUBLICATION recently of the first seven months' earnings statement of the Consolidated Rock Products Co., Los Angeles, Calif., the Pacific Coast Edition of the *Wall Street Journal* (San Francisco) has this to say, under the caption "Rock Products' Status Better":

"Position of those companies manufacturing rock, sand and gravel products in southern California, including Consolidated Rock Products Co., has been materially improved during the last month as a result of an upward readjustment of prices to levels which should permit a fair margin of profit.

"An accurate estimate of the percentage increase is difficult owing to the various factors involved, but conservative estimates give the average increase as in excess of 30% over previously prevailing price levels.

"Sharp curtailment in the volume of building, highway and street improvement activities apparent during the current year was further aggravated by price-cutting activities on the part of some of the smaller units in the trade, which had to be met by the larger organizations.

"Consensus in the trade has been that the fall would see a revival on a moderate scale of building and allied activities. While as yet there has been appreciable increase in the demand for rock, sand and gravel products, the market is distinctly firmer and outlook is for an increase in volume of business, according to trade information. To sum up the situation, a condition whereby products in many cases were being sold at prices precluding any profit margin has been alleviated through the firming up of the market, though volume of business still continues abnormally small.

"Consolidated Rock Products Co., the largest factor in the trade, in its earnings statement for the seven months to July 31, last, reflected the adverse trade situation which prevailed. It has been estimated that constituent companies comprising the present company, Union Rock Co., Consumers Rock and Gravel Co. and Reliance Rock and Gravel Co. prior to consolidation on March 1, 1929, handled 75% of the total business in this line in the California territory covered between Santa Barabra and San Diego.

"Contrasted to the net loss of $554,591 after bond interest, depreciation and depletion shown for the seven months to July 31, last, it is stated by officials that the company has now reached a point at least where red letter figures are eliminated. Any upturn in the volume of business should be quickly reflected in return to a profitable basis of operations.

"Sales of $2,322,884, reported for the seven months to July 31, produced net operating profit of $173,644. However, charges for interest, depletion, depreciation and amortization aggregating $728,236 resulted

in net loss of $554,591 for the period. The deficit was increased to $817,091 after payment of preferred dividends.

"Preferred dividends were omitted with elimination of the September 1 payment. The company has been liberal with charge-offs for depreciation and depletion and it is stated these charges averaged $80,000 monthly over the seven months' period.

"The balance sheet, as of July 31, 1930, showed total current assets of $691,382 compared with current liabilities of $412,523. As of December 31, 1929, total current assets of $1,204,032 compared with current liabilities of $674,739. According to the company, there are no bank loans outstanding and current position is maintained sufficiently well to meet present working capital needs.

"There are now outstanding 393,000 shares no par common and 300,000 shares cumulative $1.75 dividend bearing preferred stock. Dividend requirements on the preferred stock for the half year to June 30 amounted to $262,500. Units comprising two shares of preferred and one share of common were offered in February, 1929, at $58 a unit."

Reorganization of American Agricultural Chemical Co. Proposed

A PLAN of reorganization submitted to stockholders of the American Agricultural Chemical Co. on September 18, 1930, provides for formation of a new Delaware company which would issue its no par common shares in exchange for preferred and common stock of the present Connecticut company on the following basis: One share of common stock of the new American Agricultural Chemical Co. of Delaware for each preferred share of the present Connecticut company and 1/10th of a share of common stock of the new Delaware company for each share of common stock of present Connecticut company. The exchange will require the issuance of 317,875 shares of the Delaware company's common stock, 284,552 shares of which will be issued for the present preferred stock and 33,323 for the present common stock of the Connecticut company. Assuming complete exchange of stock is consummated, present preferred stockholders as a class would thus own over 89% and the common stockholders slightly over 10% of the business. This readjustment eliminates the $39,837,406 profit and loss deficit and the accumulated dividends on the preferred stock, which up to October 1, 1930, will aggregate $16,219,464.

November 1, 1930, has been fixed as the time within which deposits of stocks should be made. Chase National Bank, New York, and Lee, Higginson Trust Co., Boston, are named depositaries.

Application has been made to list certificates of deposit on the New York and Boston Stock Exchanges. Stock of the Delaware company will be issued against surrender of the certificates and application also has been made to both of the above exchanges to list the new stock.

The reorganization committee is composed of Horace Bowker, president of the company; John Foster Dulles, Charles Hayden and George C. Lee. The committee states that the reorganization plan is to pave the way for a resumption of dividends.

The common stock of the Delaware company, which would constitute the sole asset of the Connecticut company, distributable on dissolution, has an asset value calculated at the equivalent of $77 per share of outstanding preferred stock of the Connecticut company.

The Delaware company has been substituted for the Connecticut company as the obligor on the outstanding balance of 7½% mortgage bonds which as of October 1 will be $7,900,000.

Pro Forma Consolidated Balance Sheet of the Delaware company as of June 30, 1930 (giving effect to consummation of the plan of readjustment):

ASSETS

Property and equipment (less reserves)	$6,102,018
Phosphate rock deposits (less reserves)	1,796,647
Other properties and investments	2,206,524
Good-will and trade marks	1
Cash	6,728,212
Accounts and notes receivable (net)	10,528,376
Inventories	6,566,304
Sinking fund	49,847
Deferred charges	561,892
Total	$34,539,821

LIABILITIES

Capital stock (317,875 no par shares)	$17,483,125
Funded debt	8,666,500
Accounts payable and accruals	911,504
Accrued interest	277,812
Deferred credits	118,107
Contingent and federal tax reserves	2,625,978
Surplus	4,456,795
Total	$34,539,821

United States Gypsum Co. Absorbs Canadian Producer

THE CANADIAN GYPSUM CO., a subsidiary of the United States Gypsum Co., has acquired the Albert Manufacturing Co., of Hillsboro, N. B., one of the largest plaster manufacturing companies in Canada.

S. L. Avery, president of the United States Gypsum Co., when asked about the deal said: "We have acquired through one of our subsidiaries, the Albert Manufacturing Co. of Hillsboro, N. B., the oldest operating gypsum company in the world, and a leader in the Dominion's gypsum industry. This company's mines were operated first in 1813 and it was chartered as a corporation in 1856. Its product has been and is unique for purity and color.

"The plant is a modern and expensive one. The company has a wide Canadian distribution, besides a large export business with British possessions. The business and its assets are valued at over $1,000,000. The purchase was made through the medium of an exchange of stock.

"This acquisition will add largely to our Canadian business. The property will be operated under its present name and management, but as a subsidiary of the Canadian Gypsum Co."—*Chicago* (Ill.) *Daily News.*

American Aggregates Corp. Increases Logansport, Ind., Holdings

CONTAINING rich deposits which will require from 10 to 15 years to remove, the R. A. Buchanan farm west of Logansport, Ind., on new state road No. 24, has been purchased by the American Aggregates Corp., one of whose sand and gravel plants is located along the old route of state road No. 24, west. The farm consists of 154 acres.

Announcement of the deal, which was concluded recently between officials of the company and Buchanan after having been under consideration for the past month, was made by Harley W. North, plant manager.

Working of the newly acquired property is not scheduled to start at any set time and likely will not begin for several years, Mr. North stated. He said that the company had sufficient sand and gravel at its present site to last for from three to eight years.

While the sum involved in the deal was not made public, Mr. North did say that the Buchanan farm was an excellent sand and gravel site. The deposits run to an average depth of 120 ft. and the quality on an average is better than that being taken from the present site of operation.

The Buchanan farm is located just west of the Million Gravel Co. along state road 24.

Mr. North said that the purchase of the property was a move of the company to look out for its future.—*Logansport* (Ind.) *Tribune.*

Indiana Limestone Dividend

PRESIDENT A. E. DICKINSON of the Indiana Limestone Co., recently announced that the directors declared the regular quarterly dividend of $1.75 on the preferred stock. This is the 17th consecutive dividend since the organization of the corporation four years ago.

The outlook in the building industry in general is showing steady improvement, he declared, and a definite upward swing seems close at hand.

So far this year the company's sales and earnings have exceeded those of 1929.

Erratum

IN the July, 1930, issue of Rock Products we published the balance sheet of the Schumacher Wall Board Corp., Los Angeles, Calif., showing the net earnings, after all charges, for 1930 to be $97,207.

We are informed by the company that the correct amount of net earnings, after all charges, is $163,207, and that after deducting preferred dividend from this amount the balance added to surplus is $97,207.

Toledo Plaster and Supply Co. Changes Ownership

HARRY N. HANSEN was elected president and C. D. Brown treasurer of the Toledo Plaster and Supply Co., Toledo, Ohio, recently.

The changes in the official family of the company followed purchase of the interests of R. L. Witters, former president, by Mr. Hansen. Mr. Witters is now associated with the R. G. Witters Construction Co. at Coral Gables, Fla. W. G. Manning, formerly treasurer of the company and for many years previously credit manager of Lamson Brothers Co., retired from active duties on April 1.

The Toledo Plaster and Supply Co. has its headquarters at Bancroft and Albion streets, and a sand dock near the Pennsylvania railroad station. It has offices in Cleveland and Detroit, its sales representatives cover Indiana, Ohio and Michigan, and it is representative in this territory for many national manufacturers of builders' supplies. The company is capitalized at $500,000.

Mr. Hansen, newly elected president, is now president of the Ohio Builders' Supply Association, representative in the general assembly from Toledo, member of Rotary club here and one of the younger business leaders of the city. He began his association with the company in 1912 as a billing clerk, became salesman, city sales manager, secretary and later vice-president of the company. For several months he has been the acting general manager.

Mr. Brown was a classmate of Mr. Hansen's at Ohio State University and nine years ago resigned as captain in the Eighth Field Artillery at Honolulu, Hawaii, to return to Ohio and enter business here with the Toledo Plaster and Supply Co. He was graduated from Ohio State in law and practiced for a time before the World war in Columbus.

The new officers plan no changes in general policies of the company at the present time. The company has enjoyed a steady growth over more than a score of years.—*Toledo* (Ohio) *Times.*

Building Materials Catalog

A COMPLETE catalog of gypsum and lime products, probably the most complete of its kind that has ever been compiled, has just been issued by the United States Gypsum Co., Chicago, Ill.

The book presents in concise form a detailed description of the building materials of the company's manufacture, and gives estimated covering capacities, complete specifications and engineering details of special value to architects, engineers, contractors and builders, material dealers and the building trades. An unusual feature is a section devoted to the prevention and correction of plaster troubles.

The first part of the book is devoted to a description of the company's gypsum plasters, finishing and mason's lime, gypsum lath, gypsum wallboard and tile board, sheathing materials of both gypsum and fiber, and other products of this character, while the last half describes the company's fireproofing materials—gypsum partition tile, column and beam fireproofing, gypsum floor and roof materials and systems, as well as a sound insulation system and plaster and tile for acoustical correction.

Retail Prices of Various Rock Products Materials

THE TABLE below gives average prices paid August 1, 1930, by contractors for various rock products, delivered on the job at different principal cities of the United States. These prices were secured through the Bureau of Census.

Building Supply Producer, on Contractor's Default, Collects from Owner

THE Memphis Lime and Cement Co., Memphis, Tenn., recently was awarded a judgment of $681.41 against Dr. A. L. Coppedge for building materials furnished on a house recently constructed by Dr. Coppedge. Dr. Coppedge denied that he personally bought the materials or that he was liable for payment, contending he had a contract with Arthur Coleman, contractor, for a flat price of $1,900. Coleman failed to faithfully perform the work, the court held, and ruled that Dr. Coppedge, himself, authorized the purchase of the materials furnished by the building supply dealer.—*Memphis* (Tenn.) *Commercial Appeal.*

Warner Company Sales Up in July

JULY SALES of the Warner Co., Philadelphia, Penn., exceeded June sales by 6%, President Charles Warner states in a review of the company's activities covering the period since issuance of the semi-annual report. The business trend is now upwards so far as our company is concerned, Mr. Warner declares, and he expresses the belief that most lines of business will experience this gradual upward trend during the next few months.

"Sales increase in July over June is a reversal of the usual trend," Mr. Warner points out, "since July sales normally show a recession from June on account of slack construction demand during the Fourth of July week. July sales also exceed July of last year, which is the first month this year when sales exceeded the corresponding month of last year. The volume of company sales appears to be on a gradual increase at this time as compared with the gradual decline which was in evidence 12 months ago."

AVERAGE RETAIL PRICES FOR ROCK PRODUCTS MATERIALS, AUGUST 1, 1930

City	MATERIAL					
	Portland cement, per bbl. exclu. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.90	.....	$25.00	$1.50	$2.25	.....
New London, Conn.	2.80	$25.00	26.00	1.50	3.00	$18.00
Waterbury, Conn.	3.00	30.00	20.00	1.35	2.45	20.00
Haverhill, Mass.	2.80	25.00	20.00	.....	.....	18.50
New Bedford, Mass.	2.60	27.00	18.50	1.75	3.00	17.50
Albany, N. Y.	2.97	24.75	18.00	.....	.....	17.10
Buffalo, N. Y.	2.95	21.00	18.00	1.85	2.05	16.00
Poughkeepsie, N. Y.	2.18	.....	.....	2.25	2.20	.....
Rochester, N. Y.	3.25	22.00	22.00	2.00	2.40	17.00
Syracuse, N. Y.	3.00	22.50	18.00	2.00	2.25	17.00
Paterson, N. J.	2.60	25.00	18.00	1.50	2.10	16.00
Trenton, N. J.	2.40	26.00	18.00	1.50	2.10	17.50
Harrisburg, Penn.	2.65	27.00	16.00	3.10	1.50	18.50
Philadelphia, Penn.	2.30	.....	15.50	1.85	2.65	19.76
Scranton, Penn.	2.80	.....	20.00	3.25	.....	19.00
Baltimore, Md.	2.40	.....	13.00	2.25	2.75	14.50
Washington, D. C.	2.45	25.00	14.00	.....	.....	17.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmount, W. Va.	2.80	35.00	16.00	3.15	3.50	18.00
Winston-Salem, N. C.	2.80	23.50	14.00	2.50	.....	17.50
Columbia, S. C.	2.90	.....	12.00	1.00	1.75	17.00
Atlanta, Ga.	3.00	.....	17.50	2.50	3.25	18.00
Savannah, Ga.	2.25	25.00	20.00	1.75	5.50	16.00
Tampa, Fla.	2.60	.....	20.00	2.00	4.00	20.00
Erie, Penn.	2.40	22.50	19.00	2.00	.....	16.00
Akron, Ohio	2.67	.....	18.00	1.85	.....	.....
Cincinnati, Ohio	$2.94	$24.75	$16.40	$2.63	$2.55	.....
Cleveland, Ohio	2.80	22.00	16.00	1.95	2.60	$15.50
Columbus, Ohio	3.00	.....	14.00	3.00	2.25	15.50
Toledo, Ohio	2.65	21.00	16.00	1.75	2.00	14.00
Youngstown, Ohio	2.95	.....	18.00	3.71	2.75	15.00
Detroit, Mich.	2.60	21.00	14.80	2.75	3.00	.....
Lansing, Mich.	2.75	.....	22.00	2.25	2.25	16.00
Saginaw, Mich.	2.35	25.00	18.00	2.50	3.25	17.00
Terre Haute, Ind.	2.85	28.00	18.00	1.65	3.50	20.00
Louisville, Ky.	2.52	.....	15.50	.....	2.43	16.00
Chicago, Ill.	2.25	20.00	17.00	2.00	2.00	15.00
Milwaukee, Wis.	2.60	25.00	16.00	1.50	1.50	18.00
Des Moines, Iowa	2.66	23.75	20.00	1.60	3.60	10.00
Kansas City, Mo.	2.50	25.00	21.00	1.70	1.87	15.00
St. Louis, Mo.	2.45	.....	18.00	2.21	1.75	18.00
St. Paul, Minn.	2.45	.....	18.00	2.23	1.75	18.00
Grand Forks, N. D.	2.80	25.00	.....	2.60	.....	16.00
Sioux Falls, S. D.	3.00	.....	24.00	1.25	2.25	15.00
San Antonio, Texas	2.60	.....	20.00	2.10	2.35	19.15
Tucson, Ariz.	3.16	.....	30.00	1.25	2.50	17.10
Long Beach, Calif.	2.40	.....	26.00	1.95	2.20	17.50
Los Angeles, Calif.	2.30	34.00	24.00	1.00	1.30	17.50
San Francisco, Calif.	2.60	.....	22.50	1.40	1.60	17.90
Portland, Ore.	2.60	27.50	22.00	1.50	1.50	19.00
Seattle, Wash.	1.90	35.00	22.00	1.40	.....	20.00

Freight Rate Investigation of Industrial Sands

Washington, D. C., Hearing of the Interstate Commerce Commission Develops Much Information About Production and Uses of Sand

By Edmund Shaw
Contributing Editor, Rock Products

THE HEARING before the Interstate Commerce Commission on freight rates on industrial sands attracted more attention than one might think it deserved. The amount of tonnage involved is relatively small, not more than 10 to 15% of the country's sand and gravel production. But there were certain principles of rate making involved and the shippers, or some of them, were asking that new viewpoints of the sand industry be considered. Then there was the possibility that all rates on sand might be reviewed and that would have included the rates on gravel, crushed stone and slag as well. While, of course, the rates on these other materials cannot be reviewed and revised without the producers of them being given a chance to be heard, it is within the bounds of possibility that such a review may yet result from this hearing.

Producers' Contentions

In a hearing like this much of the testimony is really argument, the witness answering such questions as, "Do you advocate so and so?" In this way, it could be seen from the first that a group of the larger shippers were trying to establish: (1) That classification of sands for rate making *by their uses* was unjust if not unlawful; (2) that all sands are *merely sand,* variations among deposits being small, and hence all should be treated alike by the carriers; (3) that there should be no difference in freight rates whether shipments are made in open-top cars or in box cars.

The first proposition went over pretty well. It is manifestly absurd to charge one rate on sand if it is to be used for making steel castings and another on identically the same sand if it is to be used for plastering a wall. At the same time it was difficult to see how any classification could be made that did not take use into account. The answer may perhaps be found in the question put by Examiner Fuller to one witness. He asked him if he would be satisfied with one rate on common sand and another on all other sand. The witness answered that he would.

But the proposition that "all sand is merely sand" did not succeed so well. One shipper who had been in the silica sand business for many years said there was no relation between silica sand and common sand, geologically, mineralogically or commercially. He said common sand could not compete with his product except in a very limited degree. He considered "silica sand," "common sand" and "molding sand" to be definite terms applied to very different products. Another witness, an enthusiast for the "sand is sand" theory, hurt his case badly by including ground silica, a high-priced manufactured article, with his sand. And while laughter is not argument, when the representative of a company that buys and uses thousands of tons of sand said he could not tell silica sand from common sand, the snicker heard around the room was at least significant.

The third proposition was really abandoned before the end of the hearing, representatives of some of the largest shippers saying that they would be satisfied with rates based on the class of equipment used if there were no other classifications. But there were good arguments both ways. For example, many small consumers have no arrangements for unloading any kind of cars but box cars, which they can unload with wheelbarrows. And one of the largest consumers said that box cars were the only kind in which sand could be prevented from freezing.

Much of the testimony introduced, especially that of consumer-intervenors, was of a more or less local nature, dealing with rates from particular points to their factories. A review of this has been omitted. Those who testified of rates in general showed that the whole rate structure as it applied to sand was full of inconsistencies that often worked injustices. The evidence was so plain that this hardly admits of any argument. However, those who have studied rate making say that the same thing might be said of the rates on most commodities.

The hearing was very long, and listening to much of the testimony was a wearisome task. But it had its compensations, for it gave a fairly complete picture of the industrial sand industry today, its production and distribution, and the prices paid for it. This has been kept in mind in making an abstract of the testimony.

The carriers did not present their case and the hearing was continued until the latter part of November.

Review of the Testimony

Ralph E. Riley was the principal witness for the shippers. Mr. Riley is traffic director of the Illinois Silica Sand Traffic Bureau, an organization which the principal silica sand producers of the state maintain, and in this hearing he also appeared for the Lake Sand Corp. of Chicago and the Dayton Steel Foundry Co. The latter is a consumer of industrial sands and the former is a large producer of sand which it pumps from the shoals at the southern end of Lake Michigan. It is largely used for foundry purposes.

Mr. Riley occupied the witness stand for almost four days, and it was evident from the first that he had prepared his testimony thoroughly and by a great deal of laborious research. He introduced 75 exhibits in the course of his testimony, covering figures of production and distribution, comparison of rates with other rates on sand and on various commodities, and made comparisons with rates in other districts and rates on other classified commodities. His purpose was evidently enough to bring out that the sand

Industrial Sand Cases —1930

DOCKET Nos. 22907, 23377, 21091, 17817 (Sub. No. 1), 15833, 17822, 16296, 16250, 17060, 17272, 17272 (Sub. No. 1), 17272 (Sub. No. 2), 17338, 23019, 22098, 20554, 22476, 23111, 23111 (Sub. No. 1), 18725, 18725 (Sub. No. 1), 18718, 19978, 23340, 22338, 23245, 23226, 23446, 23560, 19743, 20803, 22053, 21849, 21486, 21553, 20733, 21133, 21133 (Sub. No. 1), 20828, 22289, 21383, 21136, 21396, 20230, 21618. P. S. C. Pa. Docket 8249.

The hearing in this proceeding was held in Room 1030, Transportation Building, Washington, D. C., before Examiner Burton Fuller of the Interstate Commerce Commission and P. E. Fickenscher, Chief, Bureau of Rates and Tariffs, Public Service Commission (Pennsylvania), September 9 to 19, 1930.

from the district in which his shippers produced was used for many things and that it took one rate for one use and a different one for another. He also showed that the whole rate structure was full of inconsistencies and was illogical as a whole.

Touching on the right to consider the use of a commodity in establishing a freight rate for it, Mr. Riley had a lot of evidence to show that this was not the common method of determining rates. He spoke of iron and steel articles which are grouped together to take the same rate, regardless of the uses to which they are put. Milk and cream are not interchangeable commodities, but they often take the same freight rate. Automobiles take the same rate regardless of age, service or "previous condition of servitude." A hearse and a joy rider's pleasure car pay the same rate, although their uses are in no sense similar. These and other examples, he thought, would substantiate his claim that use was not a generally accepted factor in rate making.

Mr. Riley's exhibit No. 4 will have an interest for ROCK PRODUCTS' readers other than its connection with freight rates, for it gives the uses of sand. It lists 105 of them, and while there are some duplications, such as "sand for making sodium silicate" and "sand for making water glass," the list as a whole is exact and the most complete the writer has seen. Some uses must represent very small tonnages, as the sand for making ink and pencil erasers, but they are real uses and sand has to be produced for this purpose.

DETAILED CLASSIFICATION OF SAND ACCORDING TO INDUSTRIAL EMPLOYMENT

1. Abrasive, ground sand as
2. Absorbent, sand as an
3. Agricultural sand
4. Annealing, sand for
5. Asbestos shingles, ground sand for
6. Asphalt pavements, sand for
7. Asphalt flooring, sand for
8. Backing sand
9. Ballast for ships or balloons
10. Banding sand
11. Bedding sand for stock cars
12. Bird grit sand
13. Brass sand
14. Brick, sand for clay
15. Brick molding, sand for
16. Brick, sand for silica
17. Brick, sand for sand-lime
18. Brick paving
19. Burnishing sand
20. Carborundum, sand for manufacture of
21. Cements, sand for
22. Chemical or laboratory sand
23. Coking sand
24. Concrete, sand for
25. Core sand
26. Cuspidors, sand for
27. Cutting and sawing sand
28. Dental sand
29. Dispeller (fog)
30. Enameling sand
31. Engine sand
32. Erasers, sand for
33. Explosives, sand for
34. Facing sand and mold wash
35. Facing tile and brick, sand for
36. Ferro silicon and other alloys
37. Fertilizer filler
38. Filler, sand as a
39. Filling mines, sand for
40. Filter sand
41. Fire sand
42. Floor sand
43. Fluxing sand (metallurgy)
44. Friction sand
45. Fused silica, sand for making
46. Furnace and fire sand
47. Glass sand
48. Golf traps, hazards, tees and greens
49. Grinding and polishing sand
50. Grinding wheels, sand for
51. Horticultural sand
52. Hour-glass sand
53. Icy streets and walks, sand for use on
54. Loam
55. Matches, sand for
56. Moisture pad, sand for use as a
57. Mold-washing sand or silica
58. Molding sand
59. Mortar sand
60. Paint manufacture, sand for use in
61. Parting sand
62. Placing sand
63. Plasters, sand for
64. Plugging oil wells, sand for
65. Polishing sand
66. Pottery, sand for use in manufacture of
67. Poultry grit
68. Railroad ballasting sand
69. Railroad fills, sand for
70. Refractory mortars and cements
71. Refractory ware
72. Roofing sand
73. Saggar or placing sand
74. Sand-bags, sand for
75. Sand-blast sand
76. Sand baths, sand for
77. Sand-clay roads
78. Sand finishing for painted surfaces
79. Sand finishing for plastered walls, sand for
80. Sandpaper sands
81. Sand piles, sand for
82. Sand seals, sand for
83. Sand tables and sand piles
84. Sawing sand
85. Scouring sand
86. Setting sand
87. Sidewalks, sand for
88. Silicon, sand for making
89. Soaps, sand for use in
90. Sodium silicate (water-glass), sand for use
91. Standard Ottawa sand
92. Stone-block pavements
93. Stucco sand, sand for
94. Sweeping compounds, sand for use in
95. Tar and roofing paper sand
96. Terrazzo floor sand
97. Testing detonators
98. Testing sand (standard Ottawa sand)
99. Tumbling sand
100. Water-glass, sand for making
101. Welding sand
102. Wood-block paving sand
103. Medicinal sand
104. Gypsum blocks and products
105. Race track drainage sand

Some Interesting Facts About Sand and Gravel

Exhibit No. 5 displayed the production of all sand from 1924 to 1928, inclusive. The interesting conclusion the witness drew from this exhibit was that while sand production had greatly increased, the tonnage shipped by rail has not increased in the same proportion. Class 1 railways at the present time, he said, hauled only 50% of all the sand and gravel produced, although formerly they hauled a greater percentage. Increased competition from trucks and from improved waterways explains this. There was the intimation that lower rail freight rates might bring back some of the tonnage that the railroads have lost to other transportation agencies. Still, this leaves something better than 100,000,000 tons to be carried by the railroads, the whole production of the United States being shown to be 209,115,298 tons. This exhibit showed the production by traffic regions and by states. The C. F. A. territory is easily first in production with 74,722,595 tons, but every state in this territory with the exception of West Virginia has an annual production of more than 10,000,000 tons, while Illinois has almost 21,000,000 tons production, about the same as New York. The figures were taken from government sources. For the prices of sand Mr. Riley introduced a table made from ROCK PRODUCTS' price quotations, which he said were accepted as authoritative.

Exhibit No. 12 disclosed, according to Mr. Riley, that Chicago-New York rates on sand were actually higher in some cases than on products made from sand. There was also a comparison with some other mineral products. Sands of all kinds have a rate of $6.30 per ton, Chicago-New York, while agricultural limestone gets off with $4.20 and all kinds of lime pay only $5.20. Practically all crushed stone is charged $6.20 for the same trip.

The witness stated that sand and gravel are loaded at approximately 3000 railway stations in the United States. As there are 60,000 stations in the country, it would appear, he said, that the contention of the Interstate Commerce Commission, that sand and gravel are available locally in practically every section of the country, is not altogether justified.

Cars for Sand Shipment

The condition of cars received by the silica sand producers to be loaded is apparently no better than that of the cars received by sand and gravel and crushed stone producers. Mr. Riley said that one producer kept a record of 136 cars received in one short period. Three were in perfect condition, 33 were in need of light repairs, 96 in need of heavy repairs, and four were in such bad condition that they were rejected altogether. Box cars which have been used for grain are often sent to be loaded with (dry) silica sand. These require very careful cleaning out and lining with a heavy grade of Kraft paper to prevent contamination.

While both open-top and box cars were used for shipping sand, Mr. Riley could not see why any difference in freight rates should result. He argued that auto-

mobile manufacturers could ship in any type of car at the same rate. Regarding the right of the shippers to use box cars, he quoted a decision of the Public Utilities Commission of Ohio, which read:

"That the shipper, however, should have the right and option of demanding box car equipment for the transportation of sand or gravel, and that in cases where box car equipment is demanded for transporting said shipments of sand and gravel the rate for such transportation should not be greater than 115% of the rate imposed for the transportation of such commodity in open cars, and such right of said shipper to demand said box car equipment, together with the charges in consequence thereof, should be a part of the tariff on file with this commission."

In the same decision it was also held that "no higher rates should be imposed for transportation of said commodity because of its supposed use than is imposed for the transportation of the same commodity because of some other or different supposed use," another view the shippers wished the commission to adopt.

Sand Business Profitable to Railways

The arguments showing that sand is a very profitable freight for the railroads to handle (that are always introduced in rate hearings) were given by this witness, who pointed out that loss and damage claims are rare, no special service, such as icing, is required, and no expedited service; reconsignment is only asked in an emergency; no special equipment is required, and there is a rapid termination of the carrier's services. It was also shown that shippers co-operate in loading to capacity or a little better than capacity. The fact is, according to Mr. Riley's exhibit No. 16, that the revenue per car-mile of sand shipped from Ottawa, Ill., to Boston, Mass., is three times the revenue derived from a carload of hay and straw, a material having the same transportation characteristics.

A part of this exhibit No. 16 showed rates from important sand shipping points into Chicago compared with rates from Chicago to the same points, which were in all cases much higher. The witness said that the rates were the result of shipper-railroad negotiations and might be called "railroad-made" rates. He advocated the same rates for silica sand as were given "common" sand in this list, with 120% of this rate where box cars were used, the only exceptions to be in the Chicago and East St. Louis industrial areas. He admitted that this would probably cause a rise in the rates on building sand.

The exhibits which followed, to No. 21, were largely concerned with the history of rates on sand, and those to No. 38 with rates from Ottawa (Ill.) and from Berkeley Springs-Mapleton (W. Va.) district. He claimed that they showed a preferential treatment in favor of the latter district over the Ottawa district. In the witness' opinion these rates constituted a violation of the fourth section of the Interstate Commerce Act.

Following these, Mr. Riley introduced a number of exhibits which together gave a very thorough analysis of the rate situation, especially in the territory of Ottawa shippers. Rates were compared as percentages of first-class rate, as revenue per car-mile, and so on, the whole effect being to show that the entire rate structure was full of inconsistencies. These exhibits were numbered No. 40 to No. 52. In summing up, Mr. Riley said that it was simply "a mess of rates" and that there was "no basis for rates as low at 30% and as high as 100%" of the commodity rates in the class to which sand belonged.

He spoke especially of competition with Wisconsin producers who were favored with a reasonable intrastate rate, and he thought the "Pennsylvania" scale applying to interstate shipments ought to be brought to the reasonableness of the Wisconsin scale.

He was asked at this point if he was speaking of rates on silica sand, and he answered that he spoke of rates on *sand* without any qualification.

Would Average Rates on All Sands

Mr. Riley gave way at this point to J. W. Brown, traffic manager of the Grasselli Chemical Co. This company buys a great deal of silica to make into silicate of soda, and he said the company's competitors were in some cases favored by freight rates. He introduced a very elaborate exhibit showing rates to the company's plants in Indiana and Ohio from Ottawa, Ill. These were compared with other sand scales. They were also compared with rates on cement, lime, ground limestone and similar commodities, the exhibit showing that silica had rather the worst of it.

Then he proposed a method of rate making which made most of the spectators sit up and take notice. His exhibit showed three rates on different sands, and the rates were $1.20 on crude sand, $1.44 on processed sand and $1.58 on ground sand. It was his opinion that a proper basis for making rates would be a weighted average made from these, which he showed to be

150,000 tons crude at	$1.20
135,000 tons processed at	1.44
15,000 tons ground at	1.58

and he said it would work out to $1.33 per ton. (The reader should remember that ground sand may be worth five to ten times as much as crude sand and requires much more careful handling in shipping.)

While he did not claim to know much about common sand, he understood that it, as well as silica sand, had many uses and he thought it was unlawful by the commission's own ruling to consider the use of a commodity in making a rate on it.

A part of his exhibit was a "constructed" rate scale which was considerably lower than the present scale, but which he said would produce the same revenue as traffic moving at full sixth class rate. A few comparative figures are:

	Present rate	Constructed rate
10 miles	$0.96	$0.84
50 miles	1.20	1.04
100 miles	1.44	1.24
200 miles	1.92	1.56
300 miles	2.40	1.96

Mr. Brown was rather sharply questioned in examination by both shippers' and carriers' attorneys. He said among other things that he could not tell a car of silica sand from one of common sand if both were in the yard, and when someone laughed he said he was not qualified as an expert on sand. He was very closely questioned as to whether in his opinion the rates on other sands than silica sands should be raised if the adoption of a new scale made this necessary. He replied that in any adjustment of rates there must be changes, but he had no intention of advocating the raising of anyone's rates. However, he thought that "every portion of the sand traffic should bear its proportion of the whole." Although there was no comment or further questioning, the logic of this did not seem to strike some of the other producers' representatives very favorably.

Another Scale Proposed

Mr. Riley resumed after Mr. Brown had concluded and continued his attack on the "Pennsylvania" scale, backing up his statement with exhibits. He concluded by showing what he called the "utter futility of trying to bolster up this scale," and then advocated a scale which he thought just and logical. It may be roughly condensed as follows:

10 miles or less	$0.50
100 miles	0.95
200 miles	1.44
300 miles	1.86
400 miles	2.21
500 miles	2.47

The progression is 5c for each 10 miles from 10 to 100 miles and 5c for each 35 miles beyond 200 miles.

Mr. Riley's remaining exhibits, from No. 57 to No. 75, were mainly comparisons of proposed rates with current rates, but some of these had special interest as showing the very substantial revenues which certain roads derive from the sand business. For example, the New York Central from Streator, Ill., to Buffalo, N. Y., which handled annually 4,124,346 tons of sand for a revenue of $2,816.54, according to his figures. The revenue of one road, the Baltimore and Ohio, he stated to be an average of 83c per ton for 3,112,158 tons.

Details of Ottawa Silica Sand Production

D. O. Snyder, sales manager of the Ottawa Silica Corp., gave interesting details of the production and uses of Ottawa silica sands. His company has three plants in the district. Deposits are in the St. Peter sandstone, which he described as a very loosely consolidated sandstone which does not require the crushing and grinding that have to be given many other sandstones to reduce them to the original grains. He described the deposit as about 65 ft. thick and said that there was from 1 ft. to 40 ft. of overburden to be removed. This overburden not only varied in depth but was spotty in character. The mining or quarrying process consisted in shooting down the bank and sluicing the material to a sump from which it was pumped to the drain bins of the plant. The washing and pumping were sufficient to reduce the sandstone to individual grains. Simple washing and screening methods followed where these were needed to prepare the sand for certain markets. The company ships no crude sand.

This sand, he said, can be and has been used for practically all purposes for which any sand is used, including concrete and building sand. It is sold largely through personal contact and he was emphatic about 100% being sold under competitive conditions. It is not true, he stated, that users will ordinarily pay a premium to get Ottawa sand. It is price and freight rate that determine what he will use. And as an illustration he stated later that Pacific Coast producers who formerly used and liked to use Ottawa sand were now using Belgian sand because it could be brought in by water about $5 a ton cheaper than Ottawa sand could be shipped in by rail.

In support of this he showed that his plant disposes of the greater part of its production in a limited area. Some 30% is sold in Illinois, 78% in Illinois and Indiana, and 82% in Illinois, Indiana, Michigan, Wisconsin and Ohio west of the Hocking Valley road. The average haul is 225 miles and except for 2.6% of the shipments the longest haul is 342 miles. Shipments made to the Atlantic and Pacific coasts are less than 1% of the total.

Actual Prices of Ottawa Sand

The average price, he said, is $1.12 per ton; the highest, $4, which is the price of a specially graded filter sand, and the lowest price $1 per ton. Not much effort is spent in trying to market the highest priced material.

He said that 35% of the production goes to glass companies, the largest users. Foundries take 30%. Chemical manufacturers, makers of water glass, silicon carbide and the like take from 15% to 20%. The remainder goes for a multitude of uses. He found it impossible to be more definite, as his company could not follow its shipments beyond a certain point. A foundry might buy a car of sand and use it as molding, facing or parting sand or fire sand, and there was no way of telling how much went to each use. The use in construction was limited in tonnage, but he declared it would be greater if it were not for the cheap sands that were "dumped on the market."

Asked about standard Ottawa sand for testing cement, he said that it took three men all day to prepare ten 100-lb. sacks of it, so the business was neither large nor particularly profitable.

"Nevertheless," said one of the shippers' attorneys, "your sand is the standard for concrete sands and it could be used for making concrete if you could produce it cheaply enough." And the witness said that it could. [Incidentally, a surprising number of people, including some engineers, think Ottawa standard testing sand *is* the standard for concrete fine aggregate, although no concrete highway specification in the country would accept it.]

No Meaning to "Silica Sand"

R. W. McCandlas, vice-president of the Standard Silica Co., Ottawa, Ill., said that his company had three plants and utilized about 40% of their potential capacity. The greater part of the product went to foundries as core sand, molding sand, furnace-bottom sand, facing sand and like uses. Many shipments were made in box cars because customers demanded the sand be shipped that way. In other cases the sand was pumped from the pit directly to cars. Water was always used to carry the sand from the pit. The process, he said, was substantially like that described by Mr. Snyder.

Competition with the dune sand loaded at Michigan City, Ind., he said, was very heavy, and he mentioned Browntown, Wis., Bay City, Mich., Muscatine, Iowa, Kankakee, Ill., and Gary, Ind., as among the places where this competition was felt.

Regarding classification, he said that to classify a sand by a certain name does not show that it is only good for that one operation. "Silica sand," he thought, did not convey any special notion to one familiar with sands, since all sands are high in silica. He regarded ordinary sand and gravel plants as competitors.

Freight rates, he said, were important in securing contracts. His company had to absorb differences in freight rate in order to get some contracts. In his opinion, it is freight rates that determine whether a sand will move or not.

He thought all sand rates should be made by a uniform plan. There was no economic or other reason of which he knew why one sand should have a lower rate than another sand.

The term "silica" should have no place in a classification, as it is too indefinite, he said. There are any number of sands, he said, that have a silica content of more than 95%. It is not chemical composition but performance that determines what a sand is good for. The classification should be simply sand, all kinds of sand, without any discrimination.

In his opinion there should be no differences in the charges for open-top and box-car shipments. Since there is no difference in the service, there should be no difference in the charge.

He had sold some sand for concrete material and he thought that the building and construction field offered the only opportunity for his company to expand his market. Assuming that he could get equal freight rates, there was no question that his company could supply material for paving and other forms of construction throughout the state.

At the end of his direct testimony, Examiner Fuller asked the witness: "You say the term 'silica sand' has no meaning?" The witness answered, "My idea is that all sand is silica. Originally the term had a trade-name significance."

On cross examination he said that the "pump sand" (sand pumped directly from the pit to cars) sold for 85c a ton and was about 15% of the output. The average price for all the production was $1.25 per ton. His company had to compete with the much cheaper Michigan City sand, and while he was not certain of the price of this competitive sand, he understood that it ranged from 12c to 50c per ton. So-called Ottawa crude sand was competitive and this sold for 50c per ton. There was some small competition in blast sands from New Jersey producers.

Prices, he said, had increased somewhat since 1927.

Akron, Ohio, Heard From

W. R. Hubbard, of the Akron (Ohio) Chamber of Commerce, took the stand to ask that Copley, a suburb of Akron, be recognized as a silica-sand shipping point and the same rates applied to it as to other sand shipping points. He said the Columbia Silica Co., of West Akron, Ohio, ships from there, producing 500 tons daily, 300 tons of which is dried sand. He hoped particularly that the commission would return to the principle of one scale for the single- and the joint-line haul. Present rates penalized shipments from Copley, he said, and he introduced an exhibit which tended to show this.

Rock Silica Producers

J. W. Williams, who is secretary of the Cairo (Ill.) Chamber of Commerce, spoke for four silica producers in southern Illinois, the American Minerals Corp. at Murphysboro, the Tamms Silica Co. at Tamms, the International Silica Co. at Elco, and the Olive Branch Mineral Products Co. at Cox. Mr. Williams is an officer of the last named company.

These all produce silica from a rock foundation, mining it by driving horizontal tunnels into the hill; the method, according to Mr. Williams, being somewhat similar to that used in mining coal. The vein of silica is 15 ft. to 20 ft. thick. He said the hills were the same as the Ozark Mountains and that similar deposits were worked in Arkansas and Kentucky. Samples of the crude material as mined—"white clay," a product called simply silica, and flint, ground and unground—were exhibited as the products of his company which, he said, came into direct competition with products of the Ottawa district. He placed the production of the Olive Branch Mineral Products Co. at 400 tons a month.

At this plant the material mined, he said, was taken by wheelbarrows to the mill, where it was washed to remove the clay. This was settled and sold for ceramic uses. The remainder was ground in a tube mill and a part was floated off, while the remainder, which was caught in tanks, was recovered and sold as "silica." The floated material was sold as ground flint or simply flint. Some unground flint was also sold. The products sold at from $4 to $10 a ton and were used in making pottery, wood fillers and paints, cleaning and sweeping compounds, soap, and in rubber. The Elco plant uses a dry grinding and air flotation process.

There is competition with English and Belgian ground silica and he thought that rates should be such that the companies he represented could compete with foreign products. The scale proposed by Mr. Riley, he thought, would remove all preferences.

He said that some of his customers wanted him to bill the product as sand, or, if he would not do this, they wanted him to absorb the difference between the silica rate and the common sand rate before they would sign a contract.

On examination he admitted that the business did not pay with the present 400 tons a month production. About half of the material mined had to be sold as railway ballast. It would be easy, in his opinion, to increase the production of profitable material if freight rates were lowered.

He was asked if his product was not advertised as "amorphous silica," and he answered that he believed this to be the case. The evident intent of the question was to throw some doubt on the classification of the material as a sand.

A Good Argument, the Similarity of All Sands

The best argument for the principle that "all sand is merely sand and hence all sands should pay the same freight rate," that was presented during the hearing, is to be found in the evidence of **W. J. Woods** of the Pennsylvania Glass Sand Corp., Lewistown, Penn. He first gave something of the geology of sands, noting that all are secondary deposits formed by the decomposition and erosion of older rocks and collected into deposits by such agencies as wind and water. These deposits are mainly of siliceous material but they vary in silica content and in the amount of accompanying impurities. Some of them are of loose sand grains; others have been consolidated by earth pressure and other agencies; but where this has occurred the chemical and physical characteristics have not been affected. Both kinds of these deposits are to be found in the Berkeley Springs, W. Va., district, where his company has plants.

Workable deposits of sand are to be found in every state and territory of the United States, but the transportation facilities of the locality determine whether any of them have a commercial value or not. The burden of his argument continued substantially as follows:

There are relatively small differences among deposits in color and silica content. The silica content can only be determined by a chemical analysis. Exact silica contents are not necessary for determining the transportation characteristics.

The users of sands give them such prefixes as come from the particular use they make of them, such as glass, foundry, milling, engine, classifier, paving, bonding, plastering, stucco, filter, refractory, brick, bedding and so on, the list he gave including several more than are given here. The iron and steel industry has its own prefixes, such as core, molding, foundry, furnace and blast. Materials for some of the many purposes listed come from every shipping point and every industry which uses sand has its own particular names for it.

The term "common sand," he said, can not be applied to any particular deposit. Such terms as "building sand" and "concrete sand" relate to uses and not to the commodity itself.

To show this he offered in evidence the United States government report, "Sand and Gravel in 1928." He asked that it be noted that the classification was entirely by use and not by the characteristics of the sand itself. A similar classification is used by the carriers in fixing rates on sand.

"Sand is sand," he said, "and there should be no more classification of sand by use than there is with other commodities."

He described briefly the method of production at Berkeley Springs. The sandstone is shot down, loaded into quarry cars with power shovels and sent to primary crushers. Then it is ground in "chaser mills" which have heavy rollers running on a circular track. Then it is screened and drained and dried. In other places, he said, hydraulic methods were used for disintegrating the soft sandstone and transporting it.

Years ago there was only one basis for making rates and sand was graded as No. 1 and No. 2. But the differences between these have now entirely disappeared.

The Pennsylvania railroad commission has said that there is only one grade of sand physically and chemically. In effect, production methods are the same with all sands. If the sand from one deposit requires more "processing" than the sands from other districts, that is merely a natural disadvantage.

Take sand for making concrete; Mr. Woods said this has to be carefully prepared because it has to meet strict specifications. And he introduced Bulletin No. 5 of the National Sand and Gravel Association to show what these specifications were.

"Sand for every field of use is processed," he said. "Hence processing cannot be considered a factor in rate making."

He mentioned some of the dredges on the Allegheny river to show how expensive and complicated some of the plants for producing and preparing common sand might be. Then he said that there were deposits of silica sand in Missouri and New Jersey in which the sand is so pure it does not even have to be washed before marketing.

Personal preferences account for differences in type of crushers, screens and washers, but the general effect is the same in all cases.

As to shipping characteristics of his company's sand, he said that sand was shipped in both open-top and box cars, the latter being used where the product had to be kept dry or free from cinders. No special equipment was required. Minor repairs to cars were made by the shipper; bad cars were rejected. Box cars were lined with paper. But all this was done regardless of the use to which the sand was to be put. Loading is heavy; where possible, 110% of marked capacity. The carload movement was uniform throughout the year, with a slight peak in midwinter. The movement of cars favors carriers, as open-top cars move toward coal fields and box cars toward manufacturing plants.

The average price is $1.77 per ton. The range in value with sands is small, much less than with other commodities.

Structural Use of Silica Sand

Mr. Woods said that structural use is the largest potential market for his company's product and he thought rates should not preclude his shipping to this desirable market. He said that his sand has been used in structural concrete, concrete highways, and for plastering. Highways have been built of it in West Virginia, and the company is making regular shipments to the West Virginia highway

commission. But such sales have been discouraged by high freight rates.

Many tests which have been made, he said, showed this sand to be the best type of concrete fine aggregate. All the concrete which the company uses in its own construction is made from it. So is the Bell Telephone Co.'s Lewistown, Penn., office building. It is used extensively by contractors for culverts and similar work, and he said more of it would be used in that way if it were not for unreasonable freight rates.

His company supplies the iron and steel industry in all its branches. But freight rates are the controlling factor in this business. Competition comes from New York, New Jersey, Pennsylvania, Ohio, Illinois, West Virginia and Michigan. Others can make a sand that will do the work, and freight rates determine which sand will be bought.

The same held true of other uses for which the sand was sold. Some of these he named were: As brick sand (raw material), roofing sand, for making silicate of soda, as fertilizer carrier, in clay products, as sand-blast sand, core sand, bottom sand, filter sand, in the manufacture of portland cement (where silica had to be added to the mix), for golf courses, for the flotation of coal, in polishing marble and slate, as engine sand and some miscellaneous uses, for all of which a very high purity of silica content was not needed. But his company, he claimed, was confined to selling sand to a limited area for these uses because of unfair freight rates.

Ohio Industrial Sands

J. S. Coxey, Jr., of the Industrial Silica Corp., testified as to the industrial sand situation in Ohio. His company was recently formed by the purchase and consolidation of some 15 or 16 producers of silica sands in Ohio and Pennsylvania. He distributed maps showing the location of the company's plants and said that all except the plants at Phalanx, Ohio, produce sand from soft sandstone. The plant at Phalanx, also known as the Portage plant, produces both sand and gravel.

The procedure at all plants is to shoot down the sandstone, load it into quarry cars with steam shovels, and take it to the crushing plant. The material prepared by merely crushing the sandstone is called green sand. Green sand is produced at all the plants but two. The crushing really fractures the grains of which the sandstone or conglomerate is made up. He introduced samples of this green sand which showed this to be true.

At Bedford and Phalanx the sand is washed and the screening methods are more elaborate. The gravel which is screened out runs from ⅛ in. to ¾ in. in diameter. The purpose of screening is not only to separate the gravel from sand, but to separate the sand into different sized products. But at all the plants except Bedford and Phalanx only one mesh-size of screen is used, its purpose being to separate that part of the material which has not been sufficiently crushed.

As compared with building sands, he said that building sands had to meet specifications that were more strict than the specifications under which green sand was bought and sold. From a processing standpoint the production of green sand was much simpler.

The term silica sand, in his opinion, might be applied to all sands. The SiO_2 content of almost all sands will run 80% or better. Many uses of sand do not depend on silica content at all. The producers of silica sand should not be barred from selling to such markets on that account. Some 90% of the orders his company receives do not mention silica content at all.

He said that the silica content in his company's products varied from 85% to 95%. The highest silica content was found in the Phalanx deposit. For foundry and furnace purposes it was necessary that the refractory quality of the sand should be the same. He said that his refractory sands were about 93% silica and were crushed to 8-mesh and finer.

He noted that competition from Michigan City, Ind., was heavy, as this material could be loaded into cars so cheaply that the price at which it sold almost prohibited competition.

Silica Gravel

He then named and described several of the samples introduced, molding sands, filter sands and sand for different foundry purposes, and blast sand, which he said was the oversize obtained from screening other sands. Among these was a sample of gravel from the Portage plant. This had a very high silica content, but it sold for the same price and was used for the same purposes as any other gravel.

This gravel has been used in building and for railroad ballast. He said that it was regularly sold in competition with river sand and gravel plants. An order for 18,000 tons, to be used as railroad ballast, from the Erie railroad, he said, had been recently received. For making railroad ballast some No. 4 mesh material was added to the gravel to increase the stability of the ballast. Bank sand and river sand companies were his competitors for this kind of business. He read the names of some of them.

Prices of Ohio Sands

The map showed the wide distribution of shipments. Prices averaged $1.81, although the range was as low as 30c and as high as $4.50 per ton. The average at different plants varied widely, the list being: $1.79, $1.52, $1.60, $1.79, $1.94, $2.27, $2.70 and $2.49.

On examination he said that certain of his customers had a decided preference for sand from a certain plant. When his company took over a number of plants an attempt was made to close down some of them, but this was found to be difficult, as customers wanted the sand they had always used. Green sand dried is called dry sand, and of course it sells for a higher price, as the cost of drying and handling must be added. Very little sand, he said, was sold to ceramic industries. Some was sold to the brick trade at $1.75 per ton. Molding sand was used for molds for steel castings and cores for iron castings. The Warwick sand contained 1½% to 3% bond, and the highest bond carried by any of his sands was 5%. None of the sands produced came in competition with Albany molding sand. Some filter sand was carried in stock. It sold at an average price of $3.50. The prices of the various kinds of sand, he said, were determined by the quantity sold, not by any difference in the grade of the sand.

Speaking of the competition of pit and river sands, he gave one striking example. Formerly his company sold thousands of tons to the Jones and Laughlin Steel Co. for lining slag pots. Now this company used river sand produced near that plant for the purpose. He tried to find out the price that was paid for this river sand, but all that they would tell him was that it was delivered at so low a price that his sand could not possibly compete with it. River sand has also displaced his sand for engine sand.

Answering a question from the carriers, he said that the reason for shipping in box cars is that the customers ask that this be done. The only box cars that are lined are those shipped from Phalanx.

Ohio Molding Sands

T. F. Ayers, of the Ayers Mineral Co., Zanesville, Ohio, said that his company had plants at Kent, Blissfield, Zanesville, Lexington, Howard and Glass Rock, all in Ohio. The last two produce silica sand, the others molding sand. The molding sand is used for gray iron castings and non-ferrous metals and competes with Albany molding sands. He gave a list showing that the sands run from 70% to 75% silica and 20% to 30% bond. Prices range from $1.25 to $2.25. Open-top cars and box cars are used for shipping. The silica sand from Howard and Glass Rock is used for steel molding sand and when washed and dried is sold for making glass and as ground silica.

J. A. Crew, a technical man of the company, followed. He is an iron and steel metallurgist who has had a long experience with the United States and other steel companies. He introduced a number of photographs showing how molding sand is produced. The process, as he described it, is simple, the sand being dug, after

the overburden is removed, by power scrapers or by shovels, and then taken by trucks to the plant. Here it goes to a storage pile under roof. A belt below this pile feeds it to a rotating wheel which feeds another belt that takes it to railroad cars. The sand does not stop moving after it goes to the first belt. The molding sand is called loam sand in the trade.

The silica sand, he said, was produced from a rock formation which is drilled and shot after the overburden has been removed. The plants have primary crushers, chaser mills and screens. After washing, the sand is run through a set of rolls. It is shipped as foundry sand, glass sand, steel molding sand and core sand from Glass Rock, and from Howard as steel molding sand and fire and furnace sand for some conditions. Engine sand, blast sand and sand for miscellaneous uses is also made, and about half the product of the Glass Rock plant is ground silica. This is sold to foundries, potteries, tile plants and other ceramic plants.

Ordinary box cars are not in good enough condition for shipping ground silica. Only about one in five can be so used, he said. The price ranges from $6 to $15 a ton, depending on the fineness to which the grinding is carried. The washed material from Glass Rock runs from 99% to 99.6% SiO_2.

The "loam" in loam sand is really clay, he said, and geologically the deposits are very new. He was asked if foundries could not buy sand and clay and combine them to make their own molding sand, and he answered that they do this. Examiner Fuller asked at this point if it would not be a good idea for sand producers to agree on the various names used to describe their products, such as molding sand, for example.

Illinois and Ohio Rates Compared

John M. McLoughlin, traffic attorney for the company, later took the stand and introduced an exhibit showing rates on molding sand as compared with some other products. One of the most striking of the comparisons shown was:

SILICA SAND

From Ottawa, Ill.

To	Distance	Rate
Edwardsville, Ill.	210	$1.64
East St. Louis, Ill.	234	1.64
Du Quoin, Ill.	248	2.27
Mt. Carmel, Ill.	261	2.00
Murphysboro, Ill.	276	2.00
Mt. Vernon, Ill.	324	2.14
Average	255.3	$1.904

MOLDING SAND

From Zanesville, Ohio.

To	Distance	Rate
Muncie, Ind.	210	$2.27
Detroit, Mich.	237	1.89
Indianapolis, Ind.	238	2.27
Kokomo, Ind.	242	2.52
Marshall, Mich.	267	2.52
New Haven, Mich.	273	2.52
Attica, Ind.	314	2.52
Average	254.4	$2.36

Another interesting comparison showed how much more sand paid the railroad than such products as wool, auto tires, automobiles, leather and green hides. In the case of cars shipped to Saginaw, Mich., which could be loaded to 68.4 tons average, the net return to the railroad was $130.07 per car as against $69.63 for leather and $34.77 for automobiles.

Silica Sand and Common Sand Not the Same

Corwin Matthews, president of the Jackson Sand Mining Co., Jackson, Ohio, disagreed entirely with the shippers who said that all sands are substantially the same. He said that silica sand and building sand are distinct commodities and that they were never used for the same purposes except to a very limited degree. Commercial sand may be found everywhere, but there is no widespread distribution of silica sand deposits.

This was the reason that such sands as Ottawa sand were shipped over large areas and hauled long distances. He said Ottawa sand would not move long distances to industrial centers like Chicago if common sand could be used in its place, for there was plenty of common sand near Chicago. Sand of high purity had to be used for making glass and in some chemical products.

He could not agree with the proposition that "all sand is sand." He believed that silica sand could bear a higher freight rate because it generally has a higher value.

He thought the scale proposed and introduced by Mr. Riley was too low. The rate of progression was too low. It took no account of inherent natural differences in sand and no account of the increase in value sand received by washing and processing. Yet it had been shown that some sands were increased 100% in value by washing. Processed sand had to be sold at a higher price because a more expensive plant had to be built to produce it.

The scale the Ottawa shippers wanted was a long distance scale which would enable them to ship into distant territory. This would enable them to get business away from smaller producers who ship into a limited area. It would greatly injure such businesses as his, he said, by taking away customers his company had served for 37 years.

He favored the retention of the present scale as shown in Docket 17817, Sub. 1, and Docket 17272. This scale, he said, takes cognizance of the fact that silica sand and common sand are not competitive and that washed and processed sands have an enhanced value.

Naturally, the cross examination of this witness by shippers' attorneys was very sharp. He was asked first what he meant by common sand, and he said he thought that it was obvious to everyone what it meant. Then he was asked if he would include lake sand with common sand. He said that this is shipped over a wide area and, while it is cheaply produced, it has a high *terminal* value. He refused to commit himself as to what percentage of silica differentiated silica sand from common sand. And in answer to a question by the examiner he said that he would be satisfied if the commission placed one rate on common sand and another on sands other than common sand.

Regarding the Jackson Sand Mining Co.'s operation, he said that it works the Sharon conglomerate, which contains from 97% to 98½% SiO_2 in grains of widely varying sizes. After being shot down the sand is sent to the plant and put through a hammer mill. The material shatters easily and is all reduced to sand size. It is sold for core sand, molding sand, fire and furnace sand, engine sand, and for brick setting. About 15% of the product is sold as plaster sand and masons' sand. The average price is about $1.25 per ton. Competition is from Ottawa, Lake Michigan sand, and sand from northeastern Ohio. Not more than 15% is shipped out of Ohio because of the disparity between intrastate and interstate rates.

Large Uses of Industrial Sand

A Mr. Armstrong, representing the Institute of Boiler and Radiator Manufacturers, Geneva, N. Y., gave some very interesting figures of the amount and prices of the industrial sands used by these manufacturers. There are 30 of them in the Institute, including such well known companies as the American Radiator Co. and the U. S. Radiator Corp. According to his testimony they use annually 433,875 tons of core sand, 175,736 tons of molding sand, 6026 tons of blast sand and 3215 tons of fire sand. Core sand cannot be used but once and its disposal is a heavy charge, amounting in the case of one company to $34,000 a year. The other sands are used more than once, but they wear out by use so that they must be replaced constantly.

A complete list of the places from which these sands were bought, the tonnage shipped by each, and the prices paid, was introduced. Some of it is interesting reading. For example, almost a fourth of the core sand came from Michigan City, Ind., and was bought at 12½ to 25 cents a ton. Still, that does not mean that it was cheap sand at the point of use. Port Crescent, Mich., shipped an even larger amount (178,157 tons) at a delivered price of $1.40 to $2.35. Both Michigan City and Port Crescent sands are dune sands, if the writer's memory is correct, which have only to be loaded directly into cars or boats. The highest price paid for core sands, f.o.b. plant, was $1.50, and the average f.o.b. plant was 91½ cents.

Molding sands averaged $1.31 in plant price, the highest, $2.50, being paid for Albany sand and the lowest, 65 cents to 80 cents, for sand from Ottawa, Ill. Blast sands, which are used for cleaning castings, averaged about $3.45 a ton, the prices ranging from $2.75 to $4.50. Fire sands averaged $1.75 the range being from $1.50 to $2.50.

A very complete exhibit showed the kind of sand, points of origin and destination, rate and classification of all the sands purchased. The classifications are certainly confusing. For example core sands were classified as common or building sand; sand (all kinds) lake and beach sand, lake, river and bank sand, blast, glass and molding sand, lake sand, washed and processed silica and simply as core sand. In some cases different rates applied to the same sand shipped in open-top cars and in box cars. Notes at the end showed classifications adopted by different roads. One of these classed sea sand, one of the cheapest sands, with expensive glass sand. But one would say that generally the intent in making these classifications was to put common or building sand in one classification and industrial sands in another.

Would Base Classification on Equipment

Edwin Brooker, who has represented the National Sand and Gravel Association in many cases and who is thoroughly familiar with the rate situation, gave what is perhaps the best statement of the position held by the larger shippers. He appeared for the Industrial Silica Corp. and said in part: "I wish to state my position with respect to the settlement of this question now before the Commission. I endorse the Ottawa proposed scale (that submitted by Mr. Riley) for single line hauls on all sands without exception. My feeling is that there can be no classification of sand based on the use to which sand is put or based on any terms which pretend to designate the use of sand. I say that after an extended experience with the sand and gravel industry. I do not think there can be any classification of sand based upon any degree of processing or preparation of sand. In other words, to my mind the carriers are not interested in the methods of preparation nor the extent of the preparation of these materials before they are tended to them for transportation. However, it is my feeling that if there are to be two classifications of sand that they shall be based upon the class of equipment used in their transportation, as this is the only way in which the railroads can police the shipments and that a producer can be assured that his competitor is paying the proper rate."

He followed this by opposing different rates for single line and joint line haul. He advocated 10 cents less than the western Pennsylvania scale for single line hauls with arbitraries of 15, 10 and 5 cents and a disappearing arbitrary for longer hauls as the commission prescribed in the Southwestern cases.

There was a rather lively wrangle with some of the attorneys for glass sand users over his position on open top and box car classification on shipments. Later he said:

"I am advocating a rate on all kinds of sand which are involved in this proceeding. I do not think the commission should change the rates on sand from any sand and gravel operation before they give the producers the chance to be heard. However, if this scale is adopted, I think it will remove a great deal of cause for contention with respect to different sand rates."

On cross-examination he was asked, "Then you mean to say that your position in these proceedings, that 'sand is sand,' applies only to the grades of sand produced by the shippers represented in this case?"

He answered, "No. I am advocating a scale which I consider reasonable for application to the entire official territory on sand."

Question: "All kinds of sand?"

Answer: "Yes; and gravel and crushed stone and slag. I take the same position with respect to all these commodities."

Milwaukee Contractor Fights Builders' Supply Body

AS NOTED IN these columns before Wisconsin has a peculiar law, originally designed to permit agricultural co-operatives, making it legal for producers to combine, divide or pro rate orders or business, fix prices—in fact do all the things the producers are apt to think are desirable from their point of view. The Wisconsin Supreme Court once decided that the law could not be applied to agricultural co-operatives to the exclusion of other producers or industries, because that would be unconstitutional discrimination. The result of that decision was that numerous co-operatives have been established, some in rock products industries. One of these is the Building Material Co-operative of Milwaukee, whose experiences have been dealt with before in these columns.

This association is now involved in a lawsuit with a contractor, whose alibi, according to the *Milwaukee Leader* is as follows:

"The whole scheme in the creation of the Building Material Co-Operative was to maintain an unlawful monopoly in the purchase and sale of lime, cement, plaster, lath, coping and similar materials, it was charged in an answer filed by S. Rauwerdink and Co. to a suit brought by the co-operative association for the collection of a past due note for $4,000.

"To illustrate how the alleged monopoly is maintained, the answer states that 27 out of 31 Milwaukee dealers in the products mentioned are members of the co-operative; that the co-operative fixes all prices, dictates the manner of sale and distribution by its members, attempts to compel manufacturers to sell only to members and compels all members to account for all sales.

"Some contractors are described by the co-operative as 'legitimate' and pay 15% less for materials than 'illegitimate' contractors.

"No value was received for the $4,000 note, the answer also sets up, and the co-operative, in attempting to collect on the note, is acting as a collection agency for the dealer who made the sale, although it is not licensed as a collection agency, is charged.

"The answer also describes how all orders among the 27 members are cleared through the co-operative, charging 2% for service."

Kansas Land Owner Wins Suit for Royalty on Material

THE TROUBLE between the board of county commissioners of Cloud county, Kans., and Miss Pauline Kennett regarding the location of the sand pump was settled recently by an agreement between both parties, and the pumping of sand will again be started. Operations were halted when Miss Kennett secured an injunction restraining the commissioners from pumping sand or gravel. The terms of the new agreement are that the county is to pay the owners of the ground on which the sand pit is located 5 cents a cu. yd. for all sand and gravel removed from the river bed, both in the past and in the future, and the owner is to have such sand and gravel as is required for her own use, but not for re-sale at the rate of 50 cents per cu. yd. Miss Kennett, through her attorneys agrees to dismiss the temporary injunction and the suit now pending, at her cost.—*Concordia* (Kan.) *News.*

Directory of Contractors

THE BUREAU of Contract Information, Inc., Munsey Bldg., Washington, D. C., has issued a Directory of Contractors which now contains the names and addresses and classifications of work undertaken by approximately 3,300 contracting concerns.

The original list, made up in loose-leaf form and which covered 2265 contracting concerns, was published on March 4, 1930, and to this initial issue have now been added the supplemental lists published on May 9 and July 14. Additional supplemental lists will be issued every sixty to ninety days.

The directory gives the performance records of contracting concerns, filed with the Bureau of Contract Information, covering their past three years of construction work, the statement of contracts on hand for the benefit of those responsible in the award of public and private construction contracts, the issuing of contract bonds and the extension of credit to the construction industry.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	Aug. 23	Aug. 30	Aug. 23	Aug. 30
Eastern	3,392	3,465	12,331	11,924
Allegheny	3,329	3,169	9,826	9,759
Pocahontas	617	469	1,537	1,819
Southern	615	706	9,846	10,996
Northwestern	839	1,187	8,940	9,322
Central Western	501	530	12,139	12,651
Southwestern	499	508	7,634	7,786
Total	9,792	10,034	62,253	64,257

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1929 AND 1930

	Limestone Flux Period to date		Sand, Stone and Gravel Period to date	
	1929	1930	1929	1930
District	Aug 31	Aug. 30	Aug. 31	Aug. 30
Eastern	115,348	100,170	358,723	267,355
Allegheny	123,029	95,232	233,061	215,449
Pocahontas	13,178	15,817	31,912	41,351
Southern	18,439	22,723	306,571	269,943
Northwestern	37,540	32,636	205,241	178,624
Central Western	17,958	16,270	353,869	335,925
Southwestern	16,518	15,409	223,240	223,113
Total	342,010	298,257	1,712,617	1,531,760

COMPARATIVE TOTAL LOADINGS, 1929 AND 1930

	1929	1930
Limestone flux	***342,010***	***298,257***
Sand, stone, gravel	***1,712,617***	***1,531,760***

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of September 20:

SOUTHERN FREIGHT ASSOCIATION DOCKET

51918. **Stone, ground or powdered,** Pounding Mill, Va., to L. & N. R. R., Cumberland Valley division stations. It is proposed to establish rates on stone, ground or powdered, carloads (See Note 1), from Pounding Mill, Va., to L. & N. R. R., Cumberland Valley division stations, on basis of the following scale (rates in cents per net ton):

	Rates
80 miles and over 69	147
100 miles and over 80	158
120 miles and over 100	159
150 miles and over 120	180

The scale suggested is the same as published in Southern Ry. I. C. C. A9818, from Mascot, Tenn., to the destinations covered by this submittal.

51931. **Lime (calcium), crude, phosphate of,** from Nashville, Tenn., to Chicago Heights, Ill., and Jersey City, N. J., eighth class rates now apply. Proposed rates on lime (calcium), crude, phosphate of, in bulk in bags, carload minimum weight 45,000 lb., from Nashville, Tenn.: To Chicago Heights, Ill., 35c; to Jersey City, N. J., 53c per 100 lb. Made with relation to rate suggested under Submittal No. 51650 from Anniston, Ala., to East St. Louis, Ill., and St. Louis, Mo.

51937. **Molding sand,** from E. & O. V. Ry. stations to Memphis, Tenn., on traffic destined to points west of the Mississippi river. Combination now applies. Proposed rate on molding sand, carload, as described in Item 8820, Agent Speiden's I. C. C. 1187, from and to points named, 245c per net ton.

51946. **Marble, ground or pulverized,** from Tate, Ga., to Tamms, Ill. Present rate, combination. Proposed rate on marble, ground or pulverized, in bags, carloads (See Note 1), from Tate, Ga., to Tamms, Ill., 453c per net ton. Made with relation to current rate to Cairo, Ill.

51948. **Gravel,** from Gravelton, N. C., to Baltimore (Curtis Bay), Md. Lowest combination is now applicable. Proposed rate on gravel, carload (See Note 3), from and to points mentioned above, 380c per net ton. Made in line with rates from and to other points in the territories involved.

51980. **Lime,** from Zirkle, Va., to points in Trunk Line territory. Southern Ry. Tariff, I. C. C. A-10052, on pages 88, 89 and 90, publishes to a number of points, the same rates on lime, carload, from Zirkle and Strasburg, Va. To the extent that this is not true in all instances, it is proposed to publish the Strasburg, Va., rates from Zirkle, Va. Statement of the proposed rates to the destinations here involved will be furnished upon request.

52017. **Talc,** from Kinsey, N. C., to destinations in southern territory. Sixth class rates now apply. It is proposed to establish the following commodity rates on talc, carloads, minimum weight 50,000 lb., from Kinsey, N. C., to Atlanta, Ga., 300c; Chattanooga, Tenn., 315c; Chickamauga, Ga., 315c; Griffin, Ga., 315c; Thomaston, Ga., 340c; Concord, N. C., 360c; Durham, N. C., 380c; Salesbury, N. C., 360c; Clearwater, S. C., 360c; Memphis, Tenn., 460c, and to Danville, Va., 428c per net ton. The proposed rates are made with relation to rates on this commodity between other points in southern territory.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

52033. **Crushed stone or marble chips,** from Gulf ports, on import traffic, to Birmingham, Ala., Chattanooga and Knoxville, Tenn. It is proposed to publish rates on—Crushed stone or marble chips, carload (See Note 3), from Gulf ports, New Orleans, La., to Pensacola, Fla., inc., to Birmingham, Ala., Chattanooga and Knoxville, Tenn. The suggested rates are made 115% of the Docket 17517 joint line scale from each port to point of destination. Proposed rates from New Orleans, as representative, are as follows: To Birmingham, 207c; Chattanooga, 247c, and to Knoxville, 282c per net ton. The proposed rates to be applicable only on import traffic and applicable from shipside.

52059. **Slag,** from Pennsylvania origins to points in North and South Carolina, Virginia, Atlanta and Port Wentworth, Ga. It is proposed to cancel, as obsolete, rates on slag, crushed or ground, and slag, crude, from points in Eastern Trunk Line territory to south Atlantic ports and destinations in North and South Carolina and Virginia, now published in Agt. Curlett's Tariffs, I. C. C. Nos. A260 and A280.

52062. **Feldspar,** from Elkland, N. C., to Erwin, Tenn. Present rate, 520c per net ton (eighth class). Proposed rate on feldspar, crude, carload, minimum weight 60,000 lb., from and to points mentioned, 200c per net ton.

52064. **Lime, common, hydrated, quick or slack,** L. C. L., between southern points. It is proposed to add the above described commodity to the list of articles taking fertilizer rates, less carload, in Agt. Glenn's Fertilizer Tariff, I. C. C. A678.

52070. **Talc or soapstone,** from Birmingham, Ala., to Atlanta, Ga. Present rate, 38c per 100 lb. (sixth class). Proposed rate on talc or soapstone, crude, ground, in bulk, in bags, carload, minimum weight 40,000 lb., from Birmingham, Ala., to Atlanta, Ga., 225c per net ton.

52091. **Stone, crushed or rubble,** from Boxley, Va., to Elizabeth City, N. C. Present rate, 205c per net ton. (Combination.) Proposed rate on—Stone, crushed or rubble, carload (See Note 3), from Boxley, Va., to Elizabeth City, N. C., 165c per net ton, based on Docket 17517 joint line scale, plus arbitrary of 25c per net ton.

52097. **Phosphate rock,** from Gulf ports (on coastwise traffic originating at Florida points) to Chicago, Ill. Present rate, 670c per net ton. Proposed rate on—Phosphate rock (other than ground phosphate rock, slush and floats, refuse and washings from phosphate rock) and soft phosphate, carload, minimum weight 80% of marked capacity of car, except that actual weight will govern where cars are loaded to their full visible carrying capacity and the actual weight is less than 80% of the marked capacity, from Gulfport, Miss., Mobile, Ala., New Orleans, La., Pensacola, Fla., and Port Chalmette, La. (on coastwise traffic originating at Florida points), to Chicago, Ill., 491c per ton 2240 lb. (Rate includes wharfage, but does not include handling charge.)

52102. Classification of **cement, lime and plaster,** L. C. L., between points in Florida. It is proposed to cancel Indices 235, 1535, 1800, 1810 and 1820 of Agt. Dulaney's Florida Classification No. 7, I. C. C. 32, covering ratings on cement, lime and plaster, etc., L. C. L., and permit Southern Classification ratings and descriptions to apply in lieu thereof.

CENTRAL FREIGHT ASSOCIATION DOCKET

26121. To establish on **cement,** common, hydraulic, natural or portland, carloads, minimum weight 50,000 lb., from Bessemer, Penn., to Fort Loramie, O., rate of 15c. Route: B. & O. R. R., Wapakoneta, O., Western Ohio Ry. (electric line). Present, 17c.

26122. To establish on **pulverized limestone,** in sacks in box cars, carloads (See Note 3), from Sibley, Mich., to LaGrange, Ind., $1.45 per net ton. Route: Via N. Y. C. R. R., Kendallville, Ind., P. R. R. Present, $2.04 per net ton.

26123. To establish on **sand and gravel,** carloads (See Note 3), from Howard, O., to Alliance, O., $1 per ton of 2,000 lb. Present, $1.10 per ton of 2000 lb.

26124. To establish on **gravel,** in bulk in open-top cars only; **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), carloads (See Note 3), from Joliet, Ill., to Miller, Ind., when routed M. C., Willow Creek, B. & O., rate of 92c. Present, 76c.

26127. To establish on **stone,** viz., breakwater, chips, rip-rap, spauls and grout, in straight or mixed carloads, minimum weight 60,000 lb., from Bloomington, Clear Creek, Dodson, Quarry Junction and Victor, Ind., to South Chicago, Ill., $1.90 via all lines. Present, $1.76 in connection with E. J. & E. Ry. only; via other lines, $1.90.

26130. To establish on **stone, crushed** (in bulk), rough (not dimension), rubble, rip-rap, limestone (unburned), agricultural (in bulk, in open cars only); screenings, limestone, carloads (See Note 3), from Whitehouse, O., to Detroit, Mich., 80c per net ton. Route: Via Wabash Ry. direct. Present, 90c per net ton.

26134. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), carloads (See Note 3), from Columbus, O., to points in Ohio via N. Y. C. R. R.

To	Prop.	Pres.	To	Prop.	Pres.
Toledo	90	120	St. Marys	70	100
Mortimer	90	120	Moline	90	120
Findlay	80	110	New Manchester	90	105
Dunkirk	80	100	Martel	80	90
Blanchard	70	100	Edison	80	90
Raymonds	70	80	Mt. Gilead	70	80
Peoria	60	70	Rich Hill	70	80
East Liberty	70	80			

26137. To establish on **gravel,** carloads (See Note 3), from Wooster, O.

To Ohio points

	Prop.	Pres.		Prop.	Pres.
Smithville	60	70	Marshallville	60	80
Shreve	60	70	Fredericksburg	70	120
Orrville	60	70	Apple Creek	70	120
Big Prairie	60	70	Loudonville	75	90
Burton City	60	80	Mansfield	80	90
East Union	60	120			

26138. To establish on **dolomite,** raw or crude, carloads (See Note 3), from Woodville, O., to Millville, W. Va., $3.30 per net ton. Present, $6.80 per net ton.

26141. To establish on **agricultural limestone,** not ground or pulverized, in bulk, in open-top cars; **crushed stone,** in bulk, in open-top cars, and **stone screenings,** in bulk, in open-top cars, in straight or mixed carloads (See Note 3), from Middlepoint, O., to Boston, Ind., rate of $1.25 per net ton. Route: P. R. R., Richmond, Ind., C. & O. Ry. Present, classification basis.

26143. To establish on **sand and gravel,** carloads (See Note 3), from Winona Lake, Ind., to Gary, Ind., in connection with the I. H. B. R. R. and M. C. R. R. as delivering carriers, rate of 95c per net ton. Present, 88c per net ton.

26144. To establish on **limestone, agricultural** (not ground or pulverized), in bulk, in open-top cars; **stone, crushed,** in bulk, in open-top cars, and **stone screenings,** in bulk, in open-top cars, in straight or mixed carloads (See Note 3), from Gibsonburg and Woodville, O., to Kokomo, Ind., rate of $1.55 per net ton. Route: Via P. R. R. direct. Present, classification basis.

26148. To establish on **crushed stone and crushed stone screenings,** carload (See Note 3), from Bluffton, Ind. (in cents per ton of 2000 lb.) To Indiana points:

	Pres.	Prop.		Pres.	Prop.
Stoners	95	80	Kendallville	115	95
New Era	95	85	Brimfield	270	100
St. Johns	95	85	Wawaka	270	100
Auburn Junc.	95	85	Ligonier	300	105
Auburn	95	85	Millersburg	300	105
Summit	95	90	Goshen	300	110
Butler	270	90	Elkhart	300	110
Waterloo	115	90	Osceola	320	110
Corunna	115	90	Mishawaka	320	115

26149. To establish on **cement, common,** hydraulic, natural or portland, in carloads, minimum weight 50,000 lb., marked capacity of car to govern, if less, from Fultonham, O., to Nemacolin, Penn., rate of 15½c. Present, 20½c.

25976. White Docket Advice No. 25976, Docket Bulletin No. 1832 of August 20, 1930, covering proposal to establish rates on **feldspar,** carload, minimum weight 50,000 lb., from East St. Louis, Ill., and upper east bank Mississippi river crossings to points in Indiana, Michigan, Ohio, Kentucky, New York, Pennsylvania and West Virginia, applicable on traffic originating in Colorado and Wyoming, is hereby withdrawn from the docket.

26150. To establish on **crushed stone and crushed stone screenings,** etc., carload (See Note 3), from Kokomo, Ind. To Indiana points:

	Pres.	Prop.		Pres.	Prop.
Delphi	SC	90	Cambria	.....	80
Brown (Clinton Co.)	IL	85	Cyclone	SC	80
			Kirklin	IL	80
Radhor	XA	85	Terhune	XA	85
Owasso	TS	80	Sheridan	TS	85
Rossville	HS	80	Westfield	HS	90

26153. To correct N. Y. C. Tariff I. C. C., L. S. 1245, Item 630, Switching Tariff, to provide for a local industrial switching charge on **sand and gravel,** from Kelly's Pit to private sidings and team tracks on New York Central of 38c per net ton, permitting present charge of 25c to stand when to and from connections. Present rate 25c per net ton.

26155. To establish on **cement,** common, hydraulic, natural or portland, carloads, minimum weight 50,000 lb., marked capacity of car to govern if less, from Bay Bridge, O. To Cazenovia, Wis., via N. Y. C., Toledo, PM, Manitowoc, C. & N. W., care of Cazenovia Southern R. R. or N. Y. C., Chicago, C. & N. W. care of Cazenovia Southern R. R., proposed rate 19c; present rate, no through rate. Combination applies. To Escanaba, Mich., via N. Y. C., Toledo, PM, Manitowoc, C. & N. W. or N. Y. C., Chicago, C. & N. W., proposed rate 19c; present rates 35½c and 43c. To Stephenson, Mich., via N. Y. C., Toledo, PM, Manitowoc, C. & N. W. or N. Y. C., Chicago, C. & N. W., proposed rate 18½; present rates, 35½c and 43c.

26159. To establish on **crude alumina sand,** carload, minimum weight 80,000 lb., from Marysvale, Utah, to Chrome, N. J., rate of $15 per net ton. Present, $20.40 per net ton.

26169. To establish on **sand and gravel** (all kinds), carloads (when loaded in open cars), (See Note 3), from Columbus and South Columbus, O., to Glenns, Bidwell, Kerrs, Gallipolis, Kanauga, Cheshire, Hobson, Middleport and Pomeroy, O., rate of 100c per ton of 2000 lb.

26176. To establish on **agricultural limestone,** unburned, in open-top cars only; **crushed stone,** in open-top cars, and **stone screenings,** in open-top cars, carloads (See Note 3), from Marble Cliff and Sullivant, O.

	Pres.	Prop.
Baltic, O.	140	110
Barr, O.	(*)	110
Navarre, O.	(*)	115

*Classification basis.

26177. To establish on **stone, crushed,** in bulk, in open-top cars; **stone screenings,** in bulk, in open-top cars, in straight or mixed carloads (See Note 3), from Kenneth, Ind. (C. I. & L. stations.)

	Pres.	Prop.		Pres.	Prop.
Rensselaer	104	85	Zadoc	127	95
Randle	127	95	Kersey	127	95
Della	127	95	Pence Switch	127	95
Lewiston	127	95	Grape Island	127	95
Newland	127	95	Beech Ridge	127	95
Gifford	127	95	Range Line	127	95
Laura	127	95	Dinwiddie	127	95
McGlinn	127	95			

26175. To establish on **limestone, agricultural** (not ground or pulverized), in bulk, in open-top cars; **stone, crushed,** in bulk, in open-top cars; **stone screenings,** in bulk, in open-top cars, in straight or mixed carloads (See Note 3), from Lima, O., to Fort Wayne, Ind., rate of 80c per net ton. Present, 90c per net ton.

26178. To establish on **limestone, agricultural** (not ground or pulverized), in bulk, in open-top cars; **stone, crushed,** in bulk, in open-top cars, and **stone screenings,** in bulk, in open-top cars, in straight or mixed carloads (See Note 3), from Kenneth, Ind., to N. Y. C. & St. L. destinations in Illinois. (Present rates, classification basis.)

To	Prop.	To	Prop.
Hoopeston	113	Oakland	126
Hustle	115	Charleston	126
Paxton	120	Lerna	139
Gibson City	125	Neoga	139
Bloomington	135	Stewardson	139
Humrick	126	Mode	139
Ridge Farm	126	Cowden	139
Metcalfe	126	Ramsey	140
Brocton	126		

26184. To establish on **sand and gravel,** carload (See Note 3), from Troy, O., to Peoria, O., rate of 90c per net ton. Present—$1.40 per net ton.

26186. To establish on **crushed stone,** carload (See Note 3), from Thrifton and Melvin, O., to Carbondale, O., rate of $1 per net ton. Present—From Melvin, O., $1.20, and from Thrifton, O., rate of $1.10 per net ton.

26193. To establish on **granulated furnace slag,** carload, minimum weight 80% of marked capacity of car, from Butler, Penn., to Detroit, Mich., $3.65 per ton of 2000 lb. Present rate and minimum weight, 23½c; minimum weight, 40,000 lb.

Sup. to W. D. A. 26127. **Withdrawal notice.** White Docket Advice No. 26127, Docket Bulletin No. 1841, of September 6, 1930, covering proposal to establish on **stone,** viz., breakwater, chips, rip rap, spauls and grout, in straight or mixed carloads, minimum weight 60,000 lb., from Bloomington, Clear Creek, Dodson, Quarry Junction and Victor, Ind., to South Chicago, Ill., rate of $1.90 via all lines, is hereby withdrawn from the docket.

26213. To establish on **cement, common, hydraulic, natural or portland,** carload, minimum weight 50,000 lb., from Bay Bridge, O.

To—	Prop. rate	Pres. rate
Grace Siding, Ind.	11	14½
Stoner Siding, Ind.	11	14½
Roanoke, Ind.	11½	13½

Route—Via N. Y. C. R. R. to Ft. Wayne and Indiana Service Corp.

26217. To establish on **sand and gravel,** carload (See Note 3), from Steubenville, O., to Wellsville Shops, O., rate of 60c per ton of 2000 lb. Present, 70c per ton of 2000 lb.

25223. (a) To amend agency and individual lines' tariffs naming rates on **sand, gravel, slag, stone,** viz., crushed, ground or pulverized; agricultural limestone; limestone, crushed, ground or pulverized; stone dust, rip rap; rubble; quarry scrap, stone screenings; fluxing, furnace or foundry, crude; dolomite, raw or crude (unburned); tailings; waste; breakwater; chip; grout and spauls, between points in C. F. A. territory, as described in C. F. A. L. Tariff 130T, also from points in aforesaid territory to points east of the Western Termini of Eastern Trunk Lines, by providing that said rates will **only** apply on traffic moving in open top car equipment.

(b) To establish on commodities named in proposition (a) when in bulk or in bags, barrels or packages, in closed car equipment, carload, minimum weight 50,000 lb., from, to and between points enumerated in proposition (a), rates on basis of 60% of sixth class.

TRUNK LINE ASSOCIATION DOCKET

24640. **Slag,** in bulk, carloads (See Note 2), from Sparrows Point (Baltimore), Md., to Alexandria, Va., $1.10 per net ton. Present rate, $1.50 per net ton. Reason—Proposed rate compares favorably with rates from Baltimore, Md., to Washington and Takoma Park, D. C.

24646. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads (See Note 2), from Morrisville and Tullytown, Penn., to Berlin Jct., Penn., $1.90 per net ton. Present rate $2.40 per net ton. Reason—Proposed rate is comparable with rate from Philadelphia, Penn., to Chambersburg to Pinola, Penn., incl.

24647. **Crushed stone,** in packages, carloads, minimum weight as per O. C., from Easton (13th St.), Penn., to lighterage deliveries in New York harbor within the lighterage limit, $2.65 per net ton. Reason—Proposed rate is comparable with rate to New York piers, Jersey City, N. J., etc.

24648. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex and/or **gravel,** carload (See Note 2), from Patapsco, Md., to Cedarville to Forest Hall, Md., inclusive, $1.30 per net ton. Present rate, $1.50 per net ton. Reason—To meet motor truck competition.

24660. To increase rate of 69c to 92c per net ton applying on **sand and gravel,** carload, from Jersey City, N. J., to Bayway, N. J. Reason—Proposed rate is comparable with rate from Jersey City, N. J., to Elizabethport, N. J.

24679. **Crude gypsum rock,** carload (See Note 2), less than 80,000 lb., from Garbutt, N. Y., to Neville Island, Walford and New Castle, Penn., $2.50 per net ton. Present rate, 15½c per 100 lb. Reason—Proposed rate is comparable with rate to Security, Union Bridge, Md., etc.

24681. **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, and pebbles, carload (See Note 2), from Philadelphia stations, Tioga St., Ontario St., Shackamaxon St. and Grays Ferry, Penn., to Camden, N. J., 75c per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

24683. To reduce minimum weight from 40,000 to 30,000 lb. on **agricultural, chemical and land lime,** covered by Note 2 from Martinsburg, W. Va., and other Group 1 points shown in B. & O. I. C. C. 21047 to Harrisburg and Steelton, Penn., for Reading Co. delivery. There is to be no change in present rate of 11c per 100 lb. to Harrisburg and 14½c per 100 lb. to Steelton, Penn. It is also proposed to restrict present rates not to apply from Security, Md., the same as at present to Reading Co.'s points in same territory by changing circle reference 60 to circle reference 3. Reason—To correct tariff errors.

24684. (A) **Sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carload; (B) **crushed stone,** carload (See Note 2).

—To Fawn Grove, Penn.—

	Proposed		Present	
From	(A)	(B)	(A)	(B)
Baltimore, Md.	175	.....	200	.....
York, Penn.	.....	140	.....	155
Campbell, Penn.	.....	145	.....	160

The above rates in cents per 2000 lb. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

24689. **Slag,** crude or crushed in bulk, carload (See Note 2), from Sparrows Point, Baltimore, Md., to stations on the W. B. & A. E. R. R., Annapolis, Md., to Washington, D. C., 90c per net ton. Reason—Proposed rate is comparable with rates on like commodities from and to points in the same general territory.

24691. **Cement,** carload, from Binnewater, N. Y., to Trunk Line territory, rates ranging from 9c to 20c per 100 lb. Reason—Proposed rates are based on 114% of I. C. C. Docket 12710 scale.

24692. **Crushed stone,** carload (See Note 2), from Bethlehem, Penn., to Reading Co. points, Trenton, Pennington, Hopewell, Hamilton, Manville, N. J., etc., rates ranging from $1.10 to $1.25 per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions within the same general territory.

24700. **Crude gypsum rock,** carload (See Note 2), but not less than 80,000 lb., from New Brighton, L. I., N. Y., to Martinsburg, W. Va., 10½c per 100 lb.; present rate 14c per 100 lb. Reason—Proposed rate is comparable with rate to Security, Md.

24709. To cancel rate of $1.40 per net ton on **sand** (other than blast, engine, foundry, glass, molding or silica), carload (See Note 2), from Oaks Corners, N. Y., to Watkins Glen, N. Y. Sixth class rate to apply. Reason—Investigation develops that there has been no movement for some time nor is there prospect of future movement, therefore rate is obsolete.

24710. To establish rate of $1.10 per net ton on **crushed stone,** carload (See Note 2), from Nazareth, Penn., to Middleport, Penn. Also to establish rate of $1.25 per net ton on **gravel and sand** (other than blast, engine, fire, foundry, glass, molding or silica), carload (See Note 2), from Mt. Bethel, Portland and Stier, Penn., to Middleport, Penn. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

24716. **Crushed stone,** carload (See Note 2), from Campbell, Penn., to Aberdeen, Md., 90c per net ton. Present rate, $1.05 per net ton. Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

24717. **Building sand,** carload (See Note 2), from Berkeley Springs, Great Cacapon and Hancock, W. Va., to Hagerstown, Md., $1.05 per net ton. Present rate, $1.25 per net ton. Reason—Proposed rate is comparable with rate on like commodities for like distances, services and conditions.

24720. **Sand, common or building** (not blast, engine, fire foundry, glass, molding or silica sand) **and gravel,** carload (See Note 2), from Tioga, Penn., to stations on the Pennsylvania division of the N. Y. C. R. R., rates ranging from 60c to $1.60 per net ton. Reason—Proposed rates are comparable with rates on like commodities for similar distances between points in the same general territory.

24721. **Crushed stone,** coated with oil, tar or

asphaltum, carload (See Note 2), from Tyrone Forge, Penn.

To—	Prop. rate
Pancoast, Penn.	185
Brookville, Penn.	185
East Brady, Penn.	170
Sligo, Penn.	185
Mayport, Penn.	185
Summerville, Penn.	195
Johnsonburg, Penn.	185
Ridgway, Penn.	170
Blue Rock, Penn.	185

The above rates in cents per net ton.

Reason—Proposed rates are comparable with rates from Tyrone Forge to Nescopeck and Pittsburgh, Penn., and from Martinsburg, W. Va., to Grafton and Clarksburg, W. Va.

M-1525. **Stone screenings,** carload (See Note 2), from Havre-De-Grace, Md., to Martinsburg, W. Va., $1.15 per net ton. Present rate, $1.60 per net ton. Reason—Proposed rate is comparable with rate on crushed stone, from Martinsburg, W. Va., to Havre-De-Grace, Md.

M-1529 (Cancels Rate Proposal 24535). **Crude gypsum rock,** carload (See Note 2), but not less than 80,000 lb., from Plasterco and Saltville, Va., to Hagerstown, Security, Union Bridge, Md., Martinsburg, W. Va., and York, Penn., $2.50 per net ton, to include deliveries to parties having private or assigned sidings on the W. Md. Ry. within the Hagerstown switching limits.

24723. **Cement,** carload, minimum weight 50,000 lb., but not less than 40,000 lb., from Alsen and Binnewater, N. Y., to 60th St., New York, N. Y., 13c per 100 lb. Reason—Proposed rate is comparable with rate to 130th St., New York, N. Y.

24728. **Cement,** carload, minimum weight 50,000 lb., but not less than 40,000 lb., from all Lehigh district shipping points to Raven Run, Penn., 9½c per 100 lb. Reason—Proposed rate is based on 114% of I. C. C. Docket 12710 scale.

24732. **Crushed stone,** carload (See Note 2), from White Haven, Penn., to Ottawa, Penn., $1.55 per net ton; present rate, $2.20 per net ton. Reason—Proposed rate is comparable with rate on like commodities for like distances, services and conditions.

24734. **Sand and gravel,** other than blast, engine, foundry, glass, molding or silica, carload (See Note 2), from Alfred, N. Y., to Himrod and Dresden, N. Y., $1.35 per net ton; present rate $1.50 per net ton. Reason—Proposed rate is comparable with rate on like commodities for similar distances, services and conditions.

24740. **Sand,** N. O. I. B. N., in open cars, carload, in packages or in bulk (See Note 2), but not less than 60,000 lb., from Stamford, Ont., to Dunkirk, N. Y., $1.40 per net ton.

24741. **Sand, common or building,** carload (See Note 2), but not less than 60,000 lb., from Stamford, Ont., to Lockport, $1.15; Medina, $1.25; Batavia, Le Roy, Caledonia, $1.30, and Rochester, N. Y., $1.50 per net ton.

24751. **Sand, blast, engine, foundry, glass, molding, quartz, silex and silica** carload (See Note 2), from Shickshinny, Penn., to Hudsondale, Penn., $1.20 per net ton; present rate, $1.30 per net ton. Reason—Proposed rate is comparable with rate on like commodities for like distances, services and conditions.

24752. **Stone, crushed or quarry broken** carload (See Note 2), from Jamesville and Rock Cut, N. Y., to Port Ewen to Newburgh, N. Y., incl., $1.90 per net ton; present rate, $2.05 per net ton. Reason—Proposed rate is comparable with rate on like commodities for like distances, services and conditions.

24753. **Sand,** other than blast, engine, foundry, glass, loam or molding, **and gravel,** carload (See Note 2), from Point Marion, Penn., to Poland Siding and Orchard, Md., $1.30 per net ton; present rate, sixth class. Rate to expire December 15, 1930. Reason—Proposed rate is comparable with rate from Pittsburgh, Penn., to Rawlings, Md., and from Bessemer, Penn., to Orchard, Md., and Central Junction, W. Va.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

20772 (1-AR). **Beach or shore sand** (See Note 3), from Gloucester, Mass.

To—	Pres.	Prop.
Lynn, Mass.	9	6
Machine Shop, Mass.	6	7
Manchester, N. H.	7	9
Marlboro, Mass.	9	8
Nashua, N. H.	14	8
Newburyport, Mass.	8	7
Newfields, N. H.	7	8
North Adams, Mass.	8	11

Reason—To correct clerical errors.

SOUTHWESTERN FREIGHT BUREAU DOCKET

21087. **Cement,** from Marquette, Mo., etc., to points on the E. S. & N. and E. & O. V. Rys. To increase the rates on cement, carload, minimum weight 50,000 lb., except when the marked capacity of car is less, in which event the marked capacity of the car will be the minimum weight.

From Kosmosdale, Ky., and Marquette, Mo., to points on the E. S. & N. and E. & O. V. Rys. to basis of 1c per 100 lb. over the rates to Evansville, Ind.

To establish on cement, carload, minimum weight 50,000 lb., except when the marked capacity of car is less, in which event the marked capacity of the car will be the minimum weight.

From all origin points to points on the E. S. & N. and E. & O. V. Rys., in cases where through joint rates may be required.

Rates on basis of 1c per 100 lb. over the rates to Evansville, Ind., from the same origin points.

It is the desire of the E. S. & N. Ry. and the E. & O. V. Ry. to participate in this traffic.

21119. **Sand,** from Fort Smith, Ark., to Cassville, Mo. To establish a rate of 7½c per 100 lb. on sand, carload, minimum weight 80,000 lb., or if marked capacity of car is less than 80,000 lb., marked capacity will govern, from Fort Smith, Ark., to Cassville, Mo. The present rate, on this traffic, which is combination of locals, it is stated, is prohibitive.

21124. **Lime,** from Lime City, Tex., to points in Louisiana. To establish a rate of 20½c per 100 lb. on lime (calcium), viz.: Common lime, hydrated, quick or slaked, carload, minimum weight 60,000 lb., from Lime City, Tex., to stations on the N. L. & G. R. R., Hodge, La., to Advance, La., incl. The producers at Lime City, Tex., are asking that the grouping of Lime City with other producing points be maintained at points of destination on the N. L. & G. referred to in Item 6850A, S. W. L. Tariff No. 8H, the same as has been previously done in connection with rates to destinations on the C. R. I. & P. named in that item, thereby placing them on a competitive basis with the producers at Austin, Tex., etc.

21129. **Cement,** from St. Louis and Alpha, Mo., to Bonne Terre, Mo. To establish a rate of 11½c per 100 lb. on cement, carload, description and minimum weight as per Item 650, S. W. L. Tariff 68L, from St. Louis and Alpha, Mo., to Bonne Terre, Mo. It is desired to publish via the Mo. Pac., Riverside, Mo., and the M.-I. R. R. the rate currently in effect via the St. L.-S. F. Ry., Crystal Junction, Mo., and the M.-I. R. R.

21139. **Limestone,** from points in Texas to points in Colorado, New Mexico, Wyoming and Nebraska. To publish the same mileage scale of rates on limestone, carload, minimum weight 40,000 lb., from New Braunfels, Round Rock and McNeil, Tex., to points in Colorado, New Mexico, Wyoming and Nebraska, as shown in Item 2500, S. W. L. Tariff 6-I, as now applicable on granite. It is desired to place the points named above on the same basis as recently approved from Whitestone, Cedar Park and Austin, Tex.

21151. **Sand and gravel,** from Cape Girardeau and Marquette, Mo., to Illinois points. To establish the following rates in cents per ton of 2000 lb. on sand and gravel, in straight or mixed carload (See Note 3), from Cape Girardeau and Marquette, Mo., to points shown below. To Illinois points.

	Rates		Rates
Benton	110	Marion	110
Cairo	100	Menard	110
Carterville	110	Murphysboro	110
Gorham	100	Pittsburg	120
Herrin	110	Potts	90
Howardton	100	Reynoldsville	90
Johnson City	110	Thebes	90
La Rue	90	Ware	90
McClure	90	Wolf Lake	90

The shipper at Cape Girardeau and Marquette desires to ship their products to the Illinois points shown but cannot compete with the shipper at Lutesville. The proposed rates will place the shippers on a rate parity.

21157. **Agricultural limestone,** from Carthage, Mo., to points in Missouri. To establish the following rates in cents per ton of 2000 lb. on agricultural limestone, crushed or ground, having value for soil fertilization purposes only, carload (See Note 2), from Carthage, Mo., to points shown below. To St. L.-S. F. Ry. stations in Missouri:

	Rates		Rates
Coburg	135	Kimpton	120
Dodson	135	Daugherty	120
Booth	130	Garden City	120
Raymore	120	Tebo	140
Coleman	120		

Shippers have requested that specific publication be made of rates on agricultural limestone, from and to points mentioned above, based upon the scale in the supplemental report in P. S. C. Mo. Case 3421.

WESTERN TRUNK LINE DOCKET

7004-C. **Silica and flint,** from Olive Branch, Ill., to Kansas City, Mo., Omaha, Neb., etc. Rates: To Kansas City and lower Missouri river points:

	Silica	Flint
Present	511	540
Proposed	270	270

To Omaha, Neb., and upper Missouri river points:

Present	511	550
Proposed	277	277

Minimum weight, present, 40,000 lb.; proposed (See Note 3), but in no case shall the minimum weight be less than 40,000 lb.

6541B. **Mine slag,** carloads (See Note 3), but not less than 40,000 lb., will apply, from Mystic, Iowa, to stations in Missouri. Present rates, class E. Proposed, to representative points: Gault, 88c; Chillicothe, 110c; Excelsior Springs, 140c, and Kansas City, Mo., 160c per ton.

1390B, Supplement 1. **Lime,** carloads, from Ft. Scott, Kan., to points in Illinois, Iowa, Missouri, Kansas, Nebraska and Wyoming. The above proposal is hereby withdrawn at the request of the proponent.

4129-O. **Feldspar,** carloads:

From Colorado common points, Golden, Colo., to Group 1 (Mississippi river). Present rates, A 610; proposed, A 550.

From Golden, Colo., to Group 2 (Peoria): Present rate, C 680; proposed, A 670, C 680.

From Golden, Colo., to Group 3 (Chicago): Present rate, A 700, B 770; proposed, A 670, B 770.

From Canon City, Colo., to Group 1 (Mississippi river). Present rate, A 550, B 610; proposed, no change.

From Canon City, Colo., to Group 2 (Peoria). Present rate, C 680; proposed, A 670, C 680.

From Canon City, Colo., to Group 3 (Chicago). Present rate, A 700, B 770; proposed, A 670, B 770.

A—Applies on feldspar, minimum weight marked capacity of car. B—Applies on feldspar, crude, in bulk or ground, in sacks, minimum weight 50,000 lb. C—Applies on feldspar, minimum weight 60,000 lb.

7383. **Limestone, agricultural** (for land fertilization purposes only), carload (See Note 3); in no case shall the minimum weight be less than 40,000 lb., from Glencoe, Mo., to points in Missouri. Rates: Present—1c per ton per mile, plus 24c per ton with minimum charge of 61c per ton of 2000 lb. for each line handling in case of a two-line haul and 57c per ton of 2000 lb. for each line handling in case of a three-line haul, with combination of local rates as maximum per Items 290 and 1110 of W. T. L. Tariff 91F. Proposed—Propose to add Glencoe, Mo., a local point on the Mo. Pac., as a point of origin in Item 1105F of W. T. L. Tariff 91F.

4742-I. **Sand and gravel,** carload (See Note 1), actual weight when in open cars and loaded to full visible space capacity, from Chillicothe, Ill., to A. T. & S. F. stations in Iowa and Missouri.

To	Miles	Pres. Rates	21755 Scale Prop.
New Boston, Ia.	113	160	115
Medill, Mo.	133	160	125
Hurdland, Mo.	170	160	140
La Plata, Mo.	182	160	145
Bucklin, Mo.	211	410	155
Carrollton, Mo.	256	410	165

(Complete copy of exhibit will be furnished on request.)

Sup. 1 to 7004C. **Silica and flint,** carload, from Elco, Ill., to Missouri river crossings, viz.: Kansas City, St. Joseph, Mo., Atchison, Leavenworth, Kan., Omaha, Neb. Rates—To Kansas City and lower Mississippi river points:

	Silica	Flint
Present	$5.11	$5.40
Proposed	2.70	2.70

Omaha, Neb., and upper Missouri river points.

	Silica	Flint
Present	$5.11	$5.50
Proposed	2.77	2.77

Minimum weight. Present, 40,000 lb. Proposed—(See Note 2) except that when weight of shipment loaded to full visible capacity of the car is less than 90% of the marked capacity of the car, the actual weight will apply. In no case shall the minimum weight be less than 40,000 lb.

5071-A. Rates and minimum weight. **Lime,** carload, minimum weight: Present—30,000 lb. Proposed—40,000 lb. From Group 1 (Ash Grove-Springfield district) and Group 2 (Johnsons, Ark.), as named in St. L.-S. F. Ry. Tariff 69L, to Omaha and South Omaha, Neb., and Council Bluffs, Ia. Rates:

To Council Bluffs, Ia.

	From— Group 1		Group 2	
	Pres. 30,000 Lb.	Prop. 40,000 Lb.	Pres. 30,000 Lb.	Prop. 40,000 Lb.
C. B. & Q. R. R.	16	17½	17½	19
C. R. I. & P. Ry.	17½	17½	19	19
I. C. R. R.	16	17½	17½	19
U. P. R. R.	20½	17½	22	19
Wabash R. R.	17½	17½	19	19

To Omaha and South Omaha, Neb.

	From— Group 1		Group 2	
	Pres. 30,000 Lb.	Prop. 40,000 Lb.	Pres. 30,000 Lb.	Prop. 40,000 Lb.
C. B. & Q. R. R.	16	17½	17½	19
C. R. I. & P. Ry.	17½	17½	19	19
Mo. Pac. R. R.	16	17½	17½	19
U. P. R. R.	20½	17½	22	19
Wabash R. R.	17½	17½	19	19

3238-D. **Slag,** granulated, minimum weight 80,000 lb., from Chicago, South Chicago, Ill., and Indiana Harbor, Ind., to Fond du Lac, Sheboygan, Oshkosh, Manitowoc, Two Rivers, Appleton and Wausau, Wis. Rates—Present, $1.20 per net ton to Fond du Lac, Sheboygan, Oshkosh, Manitowoc and Two Rivers; $1.30 per net ton to Appleton; $1.40 per net ton to Wausau. Proposed—(a) To cancel the above mentioned specific rates from South Chicago, Ill., and Indiana Harbor, Ind. (b) To restrict the rates now published from Chicago so as not to apply from points on connecting lines in the Chicago switching district.

3089-J. **Limestone, ground,** carload (See Note 3), but not less than 40,000 lb., from Hannibal and White Bear, Mo., to Cedar Rapids, Ia. Rates: Present—$2.10 per net ton. Proposed—$1.90 per net ton.

2898-H, Sup. 1. **Sand and gravel,** carload (See Note 1), from Forreston, Ill., to stations in Iowa on the C. M. St. P. & P. R. R. Rates—To representative points (in cents per net ton):

To—	Pres.	Prop.*
Ottumwa, Ia.	170	145
Tama, Ia.	160	145
Cedar Rapids, Ia.	150	120
Charles City, Ia.	180	155

*As per I. C. C. 21755.

TEXAS-LOUISIANA TARIFF BUREAU DOCKET

300-TX., Sub. 3, Sup. 1, 7440-1-TX.—Transit privileges on **limestone** at Ft. Worth when originating at Leuders, Tex.: Proposition from carriers to amend Item 899, Sup. R, Texas Lines' Tariff 2K, adding Ft. Worth as transit point. The privilege is now available at Dallas, Tex., and request has been received to extend same to apply at Ft. Worth.

I. C. C. Proposed Reports

22596. Reduction in Slag Rates. Examiner W. B. Wilbur in No. 22596, National Slag Co. et al. vs. Atlantic City Railroad et al., recommends that the Commission find unreasonable the rates and regulations on slag, from points in eastern Pennsylvania to points in Delaware, Maryland, New Jersey, New York, Virginia, District of Columbia, West Virginia, and New England, and prescribe rates and regulations for the future.

The report also embraces No. 22596 (Sub. No. 1), Duquesne Slag Products Co. vs. Same et al.; No. 22596 (Sub. No. 2), William S. Buckland, trading as Philadelphia Slag Co. vs. Same; No. 22954, Keystone Slag Co. vs. Same, and No. 22511, Keystone Slag Co. vs. B. & A. et al. Joint hearing was had with the Pennsylvania commission in No. 22596 and No. 22954 and complaints pending with the state commission bringing in issue intrastate rates. Rates are stated in amounts per net ton.

Examiner Wilbur said present single and joint line interstate rates in effect as compiled from complainants' exhibits were based on prescribed mileage scales; that the majority of rates appeared to be upon the basis of the scale prescribed by the Commission on crushed stone in state of Maryland vs. B. C. & A. Ry. Co., 49 I. C. C. 681, referred to as the Birdsboro scale which was also prescribed on slag in Duquesne Slag Products Co. vs. P. R. R. Co., 92 I. C. C. 554, with an added arbitrary of 20 cents in the latter for joint-line hauls, referred to as the Duquesne scale. Other rates shown, said he, appeared to be upon basis of scales A and B prescribed in Buckland vs. B. & A. R. R., 139 I. C. C. 88, referred to as the Buckland scale, which also provides a joint-line arbitrary of 20 cents over the single-line scale A. The Buckland scale, said he, further provided a 70-cent arbitrary for car-floatage in New York Harbor and the inclusion of not more than three line-haul carriers in computing short-line distances.

The examiner said that the Buckland scale B should be modified to permit the inclusion of not more than four line-haul carriers in computing short-line distances instead of the present limitation of three line-haul carriers, and as so modified it should apply from all points of origin named in the proceeding to the entire New England territory.

In discussing the scales proposed in the proceeding, the examiner said that the Buckland scale, with some alteration in gradations and progression, was considered as better adapted to the prevailing conditions in the territory under consideration than any of the other scales suggested. Continuing, he said:

"Complainants criticize the gradation and progression in the Buckland scale for the shorter distances and contend that the discrimination between producing points is aggravated thereby. The present scale starts at 60 cents for 15 miles or under and progresses to 70 cents for 25 and over 15 miles, to 80 cents for 40 and over 25 miles thereafter up to 100 miles the mileage blocks are uniformly 20 miles with an increase of 10 cents for each additional block. The blocks up to 40 miles are not only shorter when compared with most scales on slag and like commodities but vary as compared with each other. Notwithstanding their length the same rate of progression is applied as in scales where the blocks are uniformly 20 miles. The tendency of the shorter mileage blocks is to reduce the number of producing points that may ship on the same rate to a given point.

"The foregoing may be alleviated by starting the scale at 65 cents for 20 miles and under and from thereon to 100 miles add 10 cents for each additional 20 mile block to 100 miles, 12.5 cents for each additional 25 mile block to 150 miles and from thereon follow the present Buckland scale as follows:

	Present Buckland Scale A*	Proposed Scale*
15 miles and under	60	65
20 miles and over 15	70	65
25 miles and over 20	70	75
30 miles and over 25	80	75
35 miles and over 30	80	75
40 miles and over 35	80	75
60 miles and over 40	90	85
80 miles and over 60	100	95
100 miles and over 80	110	105
125 miles and over 100	120	117.5
150 miles and over 125	130	130
175 miles and over 150	140	140
200 miles and over 175	150	150
230 miles and over 200	160	160
260 miles and over 230	170	170
290 miles and over 260	180	180
320 miles and over 290	190	190
350 miles and over 320	200	200

*Rate in cents.

"Complainants have made numerous comparisons of the rates on slag with rates on crushed stone, sand, and gravel which indicate that generally the level of the rates assailed is higher. This is supported also by the defendants' table of the difference in revenue previously shown herein on these commodities under the present rates as compared with the constructive revenue based upon the Buckland, West Penn and defendants' proposed scales respectively. The record is not definite as to that fact being a contributing cause in the way of restricting the sale of slag in face of other testimony indicating that slag has certain infirmities inherent in itself as compared with competing materials. Therefore a finding of undue prejudice is not warranted by the record. It is plainly evident, however, that the rates on crushed stone, sand, and gravel in the territory involved are in a chaotic condition and should be adjusted to some definite basis.

"The Commission should find that the rates assailed are and for the future will be unreasonable to the extent that they exceed or may exceed the rates shown in the following table under Scale A to points in Delaware, Maryland, New Jersey, New York, Virginia, District of Columbia, and West Virginia and under scale B to points in New England, subject to the addition of 20 cents per ton to the rates under Scale A for movements over two or more line-haul carriers, also subject to the addition of 70 cents per ton to the rates under either scale for hauls involving carfloat or lighterage service in the New York harbor district on traffic to points in New York or New England, respectively.

	Scale A*	Scale B*
20 miles and under	65	.....
40 miles and over 20	75	.....
60 miles and over 40	85	.....
80 miles and over 60	95	.....
100 miles and over 80	105	.....
125 miles and over 100	117.5	150
150 miles and over 125	130	160
175 miles and over 150	140	175
200 miles and over 175	150	185
230 miles and over 200	160	200
260 miles and over 230	170	210
290 miles and over 260	180	225
320 miles and over 290	190	235
350 miles and over 320	200	250

*Rates in cents.

"The Commission should further find that in computing distances for the application of the distance scales prescribed in this proceeding the shortest routes should be used over which carload traffic can be moved without transfer of lading.

"The defendants may file applications for such relief from the long-and-short-haul provision of the fourth section as they may require in connection with the rates prescribed."

I. C. C. Decision

22300. Cement Rates Reduced. In a report written by Commissioner Lewis, the commission, by division 5, in No. 22300, Missouri Portland Cement Co. vs. A. & S. et al., opinion No. 15995, 167 I. C. C. 650-60, has found unreasonable the rates on cement from Prospect Hill (St. Louis), Mo., to points in Scales III and IV territories in Oklahoma and Texas to the extent the rates exceeded or may exceed those made by applying the scales mentioned. It has awarded reparation and ordered new rates on the bases mentioned made effective not later than November 20.

Bases of rates requested by the complainant were those prescribed in Iola Cement Mills Traffic Association vs. A. W., 87 I. C. C. 451, and Oklahoma Portland Cement Co. vs. D. & R. G. W., 128 I. C. C. 63. In the first mentioned case rates were prescribed from the Kansas gas belt and Ada, Okla., to eastern Oklahoma points. In the second case rates were prescribed from Ada and the Kansas gas belt to Texas Scales III and IV territories.

In this case the carriers opposed an award of reparation on the ground that reparation had been denied in the general revision resulting from the cases mentioned. Commissioner Lewis points out, however, that in those cases there were both increases and reductions. In the instant case, he said, however, any adjustment of rates would be downward. Further he pointed out that the complainant, for several years, had been endeavoring to obtain a lower basis of rates on account of its competition with the Kansas mills. Mr. Lewis said that the assailed rates appeared to be intrinsically unreasonable under any adjustment. For that reason and in accordance with the decision in Oklahoma Portland Cement Co. vs. Santa Fe, 163 I. C. C. 249, he said, the complainant was justly entitled to reparation.

Foreign Abstracts and Patent Review

Burning Cement in a Traveling Grate Plus Rotary Kiln Plant. Erich Schirm states that the drawback of the shaft kiln is an uneven burn and that the drawback of the rotary kiln is a high fuel consumption. He points to the traveling grate as a means of combining the good characteristics of both shaft kiln and rotary kiln. Then he describes the use of the traveling grate in burning ores, as it offers an explanation of the possibilities of adapting the traveling grate to the burning of cement. Then the author gives two examples of applying this method to the burning of cement and lime, respectively.

In the application to cement burning, in which the material is supplied in three layers for grate protection, (1) clinker, (2) raw material and (3) coal, the clinker heat and the waste heat are not utilized, and during the burn the cement is first calcined and then sintered, so that the cement tends to stick during the sintering, causing also an increase of resistance to the gas flow. Consequently the cement is not burned to a finish and as a result this type of installation has not been applied to continuous operation.

In the second example the traveling grate is designed to burn lime with the application of heat from several outside zones, in each of which the gas supply can be adjusted. Here also the grate bars are first covered with a protective layer of burned material. Some coal is added to the material to be burned to assure a more uniformly burned product. A cooling and preheating zone could be added here also, but the installation would not be suited for burning cement.

The main difficulty in sintering the cement is the tendency of the clinker to stick. The solution was provided by Lellep in the design of his combined traveling grate and rotary kiln unit covered by the German Patent No. 466,298. He gave up the idea of sintering on the traveling grate and transferred this process to the rotary kiln which is so well suited to it. Consequently the material is merely preheated and calcined on the traveling grate. Then it is delivered to a rotary kiln installed back of the traveling grate on which it is sintered. This kiln is considerably shorter than customary since only one process is carried on in it. The author proceeds then to investigate the processes in this cement plant which is illustrated in Fig. 1.

The dry, powder-like raw material is first formed into small balls in a primary drum by adding water in drops, around which the raw flour gathers, due to the rotary motion of the drum, so that in a continued rotation a rather uniform pea-size to hazelnut-size mass of balls is formed. These balls do not have the strength of briquettes, for they can be crushed between the fingers, yet they do not fall apart when dropped several meters, and they are cheaper to produce than briquettes.

These balls pass into a reserve bin and are supplied from it in a uniform layer to the traveling grate upon which the drying and calcining process takes place. The traveling grate is heated with the waste gases from the rotary kiln located back of the grate. These gases impinge from above upon the grate and are drawn through by a suction blower located beneath the grate; the suction box may be divided into several zones. The grate interstices are so narrow that the balls of material cannot drop through, and they retain their body in the drying and calcining process, for they are at rest. Later, in the actual burn, they harden.

The waste gases heat the upper portion of the layer to a complete sintering, but their temperature drops gradually until it reaches 550 deg. C. or 1022 deg. F. when reaching the grate bars. This temperature prevails near the discharge end of the grate, but near the charging end it goes down to 50 deg. C. or 122 deg. F., for here the raw material enters in a cool state. The average temperature beneath the grate is but a little over 100 deg. C. or 212 deg. F., so that the grate bars do not burn nor require cooling.

An absolutely uniform burn upon the grate is not necessary, for the finish burn occurs in the rotary kiln in which sintering also takes place. The rotary kiln is about one-third the length of the ordinary rotary kiln, and the traveling grate is even shorter. The author reasons that it would not be advisable to transfer more of the burning operation from the kiln to the grate, for the temperature on the grate would then have to be raised, making necessary the use of grate-cooling equipment, a thinner layer of raw material on the grate and a repeated passing of the same waste gases through the material to utilize its heat content.

The traveling grate acts as an excellent dust remover for the flues or waste gases, the raw material through which it is drawn being the filter, so that the dust deposits upon the raw material, aided by the small uniform size of this material. Due to the uniform granular shape of the raw material, no dust is taken from it and the waste gases enter the stack practically dustless, eliminating a special dust-removing plant.

The rotary kiln is but slightly longer than the ordinary sintering zone, and the burned product is quite uniform in quality with but

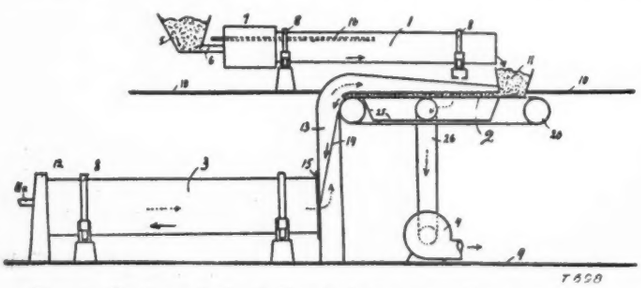


Fig. 1. Design of the Lellep-Polysius traveling grate plus rotary kiln plant, comprising granulating drum, traveling grate for drying and calcining, rotary kiln for sintering, and heating of the traveling grate with the waste gases from the rotary kiln

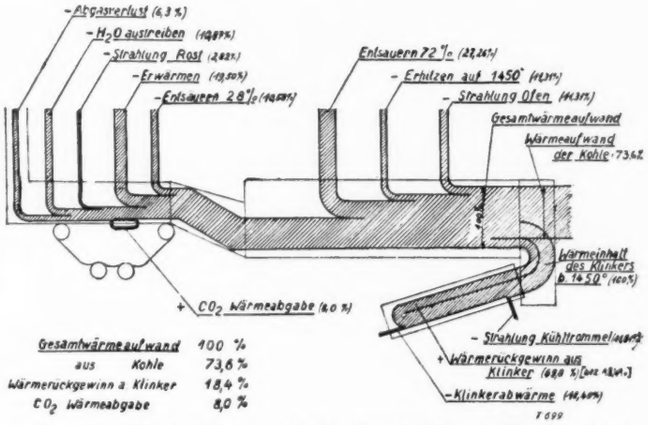

- Abgasverlust (6,3 %)
- H_2O austreiben (10,87%)
- Strahlung Rost (2,82%)
- Erwärmen (19,50%)
- Entsäuern 28% (10,58%)
Entsäuern 72% (27,26%)
- Erhitzen auf 1450° (11,31%)
- Strahlung Ofen (11,31%)
Gesamtwärmeaufwand
Wärmeaufwand der Kohle 73,6%
Wärmeinhalt des Klinkers b. 1450° (100%)
+ CO_2 Wärmeabgabe (8,0 %)
- Strahlung Kühltrommel (11,81%)
+ Wärmerückgewinn aus Klinker (69,8 % [von 18,4%])
- Klinkerabwärme (18,40%)
Gesamtwärmeaufwand 100 %
aus Kohle 73,6 %
Wärmerückgewinn a. Klinker 18,4 %
CO_2 Wärmeabgabe 8,0 %

Fig. 2. Heat balance of the Lepol kiln at Ruedersdorf

Reading from left to right, first at top, then at bottom of cut:

Waste gas loss, 6.3%.
Expelling H_2O, 10.87%.
Radiation, grate, 2.82%.
Heating, 19.50%.
Deacidifying 28%, 10.58% (calcining)
CO_2, heat given off, 8.0%.
Total heat requirement, 100%.
From coal, 73.6%.
Heat reclaimed in clinker, 18.4%.
CO_2, heat release, 8.0%.

Deacidifying 72%, 27.26%.
Heating to 1450 deg. C. (2642 deg. F.), 11.31%.
Radiation, kiln, 11.31%.
Total heat requirement, 100%.
Heat requirement of coal, 73.6%.
Heat content of clinker, at 1450 deg. C. (2642 deg. F.), 100%.
Radiation, cooling drum, 11.81%.
Heat reclaimed from clinker, 69.8%, based on 18.4%.
Clinker waste heat, 18.40%.

a slight overburn having been started here and there on the traveling grate. Tests on cement have shown that the quality of the cement from this cement plant is uniform with the quality of cement from the customary rotary kiln plant, that the compressive strength is equal and that the tensile strength is even a little higher.

The first large experimental plant of this kind was installed in the portland cement plant Ruedersdorf, Guthman and Jeserich at Kalkberge i. Mark, Germany. An old disused rotary kiln was employed in building the plant, but the cooler was built too small, so that more favorable results than obtained here could be expected of a new plant. The coal used had an average heating value of about 6450 kcal. per kg. (11,610 B.t.u. per lb.) at 12.5% ash content. The raw flour consisted of 76.5% $CaCO_3$ with a moisture content of 13.5%. The air excess fluctuated between 1.05 and 1.1. The heat consumption was on the average about 1045 kcal. per kg. (1881 B.t.u. per lb.) of clinker. The temperature of the waste gases was from 900 to 950 deg. C. (1652-1742 deg. F.) above the traveling grate, was not measured below the grate, and was from 105 to 110 deg. C. (221 to 230 deg. F.) back of the suction blower. The draft of the waste gases beneath the grate was from 180 to 250 mm. (7.09 to 9.84 in.) of water gage, depending on the output of the kiln, the lower figure being for normal operation. It was figured that about 28% of the carbonic acid in the raw material was expelled upon the grate and the remainder of deacidifying took place in the rotary kiln. Fig. 2 gives further data on the heat balance. A rotary kiln clinker is thus produced at a fuel consumption which is considerably below the fuel consumption of the customary rotary kiln and even lower than the fuel consumption of the shaft kiln, while at the same time all dust is removed from the waste gases. Moreover, the traveling grate plus rotary kiln plant is smaller than the customary rotary kiln plant.—*Tonindustrie-Zeitung* (1930) **54,** 59, pp. 978-981.

Italian Specifications for Special Cements. The official Italian specifications for special cements cover (1) alumina cements which must contain at least 35% alumina; (2) high strength cements containing marls or mixtures of argillaceous and calcareous materials; (3) blast-furnace cements mixed of pulverized pure clinker of slow set and of basic slag; (4) pozzuolana cements formed of pure cement clinker and of pozzuolana of acid reaction.

None of the cements must contain more than 3% MgO (the blast furnace cement should not contain more than 5% MnO) nor more than 1.5% SO_3; the addition of inert materials is prohibited. The specific gravity should be 3.05, the maximum residue on the 900-mesh (metric) screen 2%, and on the 4900-mesh screen 15%; the period of set from 1 to 4 or 7 hour for the alumina cements, and of 1 to 6 or 10 hours for the "super-cements." The minimum strengths in kg. per sq. cm. for normal 1:3 mortars should be, for the alumina cement: 25 after 2 days, 30 after 7 days and 35 after 28 days for tensile tests, and 350 after 2 days, 450 after 7 days, and 500 after 28 days for compressive tests; and for the "super-cements" 20 after 3 days, 25 after 7 days and 30 after 28 days for tensile tests, and 250 after 3 days, 350 after 7 days and 500 after 28 days for compressive tests.—*Giorn. chim. ind. applicata.*

Process for Latent Hydraulic Binding Agents. Latent hydraulic binding agents may be stimulated to develop their hydraulic energy by addition of sulphides of the alkaline earths, as for example calcium sulphide. They can replace part of the portland cement as exciting agent; or, with an addition of calcium sulphide to the regular proportion of portland cement considerably greater strengths can be obtained. The calcium sulphide reacts with water according to the equation: $2\ CaS + 2H_2O = Ca(OH)_2 + Ca(SH)_2$ and thus increases the alkalinity and with it the exciting action. Not more than about 10% of sintered marl or hydraulic lime sulphide of the earth alkalies is added to the mixture of slag, or similar material, and portland cement. German Patent No. 496,958.—*Tonindustrie-Zeitung* (1930) **54,** 52, p. 865.

Pneumatic Handling of Lime. F. Kirchberg describes the system for dust-free pneumatic conveyance of lime from or to freight cars, as developed by the Miag concern.—*Tonindustrie-Zeitung* (1930) **54,** 42, pp. 704-706.

Calculation of Heat Flow in Rotary Cement Kilns. H. Bussmeyer criticizes A. B. Helbig (see *Zement*, 1930, No. 19) for statements made in calculating the heat flow of the new G. Polysius rotary kiln. Bussmeyer shows that this kiln is *unlike* the kiln covered in a British patent, and used by Helbig for a comparison in calculating the heat flow of the Polysius kiln. Helbig has not recognized the basic features of the Polysius kiln and has made some errors in his calculations. Moreover, comparison between two different kilns must include not only calculation of the heat flow, but also the total costs of installation, the operating costs, the grinding costs, the coal costs, the losses in dust, and other items, in order to arrive at a definite final conclusion.—*Zement* (1930) **19,** 22, pp. 522-524.

Tractive, Flexural and Compressive Strengths. R. Feret gives a bibliography on the subject, including a method of research for comparing compressive and tensile strengths of mortars or their constituents by means of graphs.—*Revue des Materiaux de Construction et de Travaux Publics* (1930) 244, 245, 246.

Chemical Behavior of Si Material, Trass and Diatomaceous Earth. Max Stiller replies to the article of Dr. P. Mecke (*Tonindustrie-Zeitung* No. 26, 1930) and shows that it is too early to draw definite conclusions from it. P. Mecke answers.—*Tonindustrie-Zeitung* (1930) **54,** 38, pp. 642-643.

Producing Uniform Quality Cement. Marcel Bernasconi presents a comprehensive article on how to manufacture a cement of uniform quality. Many facts are given in this discussion, from the raw stone to the finished cement, which, however, are generally known.—*Revue des Materiaux de Construction et de Travaux Publics* (1930) 246, pp. 81-88.

A Swiss Quarrying Plant. H. Cotte states that the Societe Anonyme D'Exploitation des Sables et Graviers De La Dranse, has installed on the shores of Lake Geneva, Switzerland, a modern plant for the dredging, crushing, sizing and grading of hard limestone at the rate of 50 cu. m. per hour. A classification of the aggregate materials produced is given, and their application. The equipment which is described, was provided by Neyret-Beglier, Grenoble.—*Revue des Materiaux de Construction et de Travaux Publics* (1929) 243, pp. 422-428.

Acid-Proof and Fire-Proof Cement. In order to produce a cement of a greater resistance than ordinary cement to fire and acid and suitable for lining cookers and vessels for the dye and chemical industry and melting furnaces, a unit of 70% cement is mixed with 30% lead superoxide in a dry and cold state, and the mix then handled like normal cement. The lead superoxide may be replaced with "Massikot" or finished lead minium Pb_3O_4 to Pb_4O_5. During heating of the finished, dried and hardened cement, the chemical changes into lead oxide.—*Baumarkt* (1930) **29,** 30, p. 1010.

Determination of the Specific Gravity of Cement. Karl E. Dorsch describes an apparatus for the accurate but rapid determination of the specific gravity of cement consisting of a pycnometer having a 2-3 cm. mount into which a long graduated neck is ground; 100 g. of cement is introduced with C_6H_6 and shaken after stoppering. Then the neck is connected and liquid is run in from a buret to the mark with final adjustment at constant temperature.—*Tonindustrie-Zeitung* **54,** 627-8 (1930).

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Neutralizing Acid Waste Waters. Waste waters such as those containing H_2SO_4 are passed in a freely flowing stream over a neutralizing agent such as dolomite and then over $CaCO_3$. The rate of flow of the waste water and the surface of the treating material are so proportioned to each other as to effect neutralization.—*Aaron M. Hageman and Wm. L. Sullivan (to Westinghouse Lamp Co.). U. S. No.* 1,765,424.

Pertinent Paragraphs

¶

Interesting items from everywhere condensed and "abstracted" for the benefit of busy readers

By Hugh Sharp

OVER in Leicestershire, England, is the largest granite crusher in the United Kingdom. Editor McPherson of the *Quarry Managers' Journal* weeps copious tears into his ink well as he writes: "It might seem unfortunate that the crusher which made it possible for Leicestershire to lead the way in quarrying is manufactured in America," but hurries to explain that the manager of the quarry "could not get a machine in England large enough to meet his requirements." No doubt he refers to the Allis-Chalmers unit described in our Cliffe Hill quarry article June 7.

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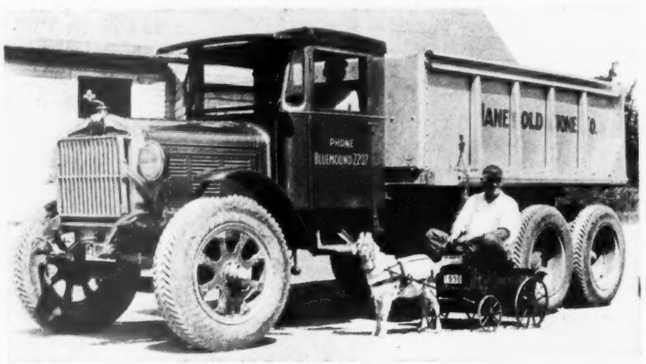
WE DO NOT KNOW whether Bill Manegold's proclivities run toward getting the goats of his unwary contemporaries or not, but the picture reproduced indicates clearly that Bill captured somebody's goat. To all appearances he has this bearded patriarch of the tribe Angora under perfect control. As most crushed rock folks know, Bill is none other than the estimable William R. Manegold, president and general manager of the Manegold Stone Co., Milwaukee. For the background of this portrayal of his unusual driving ability he has selected one of the company's new motor trucks equipped with an aluminum body. We told you something about his enthusiasm for this type of hauling in our New Machinery pages, July 19 issue.



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A NEW BIG INDUSTRY is needed to use our surplus funds, energies and employes, says a recent bulletin from the La Salle Extension University. What it will be, deponent sayeth not.

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TALC PRODUCERS will have competition. According to a newspaper item from Columbus, Ga., the International Products Co., Wade Moss, president, has discovered a process for making face powder from white Georgia clay. The story goes on to say that orders have been received to keep the plant busy for a year.

YOU, TOO, probably, have allowed some radio speakers to drone on and on while you were busy abstracting your evening newspaper. The other night, during the Halsey-Stuart hour, Col. W. A. Starrett, president of the Starrett Corp., started talking on "The Future American City." His forceful, attention compelling address didn't give us a chance to even glance at the newspaper. It certainly is a far cry from the first skyscraper built in Chicago for the Home Insurance Co. in 1885, 10 stories high and costing $500,000, to the present solid-block structures representing an investment of $15,000,000 to $20,000,000. The colonel told of a building being built now to be 85 stories high, surmounted by a mooring mast for dirigibles which will be about 1300 ft. above the street level.

PRESIDENT HOOVER'S admonition to speed things up and thus reduce unemployment has been carried out by the state of Pennsylvania which pushed its highway construction plans so that by June 1 four-fifths of all road contracts had been awarded. Concrete is being placed at the rate of five miles daily and 26,000 state and private employes have been benefited.

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INDUSTRY IS passing from an era of finance to mergers of effort, according to Bennett Chapple, vice-president, American Rolling Mill Co., who discusses "What's Ahead in Industrial Marketing" in Executives Service Bulletin issued by the Metropolitan Life. "The progress of the world, however, will always come from individual effort rather than from mass production," he writes.

CHICAGO'S racketeering problem is being given serious consideration by the business men of the community. The latest pronounced step forward in prevention and punishment of crime is the appointment of a committee listing in its membership every important business and civic enterprise. Two of the men chosen are Sewell L. Avery, president of the United States Gypsum Co., and B. F. Affleck, president of the Universal Atlas Cement Co. That this committee means business is evident in the reply of its chairman, Col. A. A. Sprague, to newspapermen, asking what the policy would be. "Too much has been said and too little done," he said. "I have no hot air to shoot."

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A LANDSLIDE which displaced 24,000 tons of limestone is reported in the quarry of a cement works at Pinsdale, England. About 10,000 tons collapsed over the face of the quarry. A 6-in. bed of clay was responsible. Fortunately, no one of the 60 men working near the slide was injured, and sufficient warning also had been given so that two shovels could be removed from the danger zone. The area involved in the slide had been drilled for blasting, which was rendered unnecessary.

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INTERESTING to study are the thorough, businesslike methods the National Tuberculosis Association employs for assuring the success of its annual Christmas seal campaign. While the time is still far off, between Thanksgiving and Christmas, already publishers are receiving a prospectus containing electros of advertisements prepared by one of the largest eastern advertising agencies and an assortment of stories and articles. This organization does its Christmas selling early and deserves support. Deaths from tuberculosis are showing a marked decline and much of the credit belongs to the popular little Christmas seal. This is the 24th annual campaign. Some 1400 local associations are taking part.

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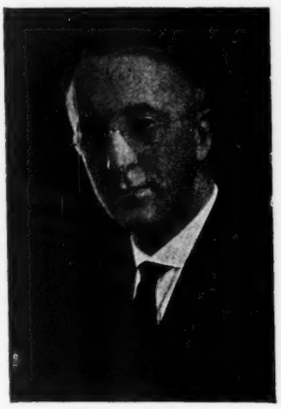
THE ART OF MAKING lime goes back more than 4000 years, they say, so it is rather obvious that any statement vouching for the name and place of the first lime producer would deal with somewhat obscure data. Historians know that the Pilgrims brought to America the art of lime making. That was in 1620. Over in England, at Clitheroe, the oldest borough in Lancashire, is the firm of Richard Briggs and Sons, Ltd., which started operations in 1775, at the time when the American colonists were staging the famous battles of Lexington, Concord and Bunker Hill. Succeeding generations of owners have kept the Briggs' plant thoroughly modern in every respect.

Northwest Regional Safety Meeting

Cement Mills of Oregon, Washington and British Columbia Hold Inspiring Sessions at Seattle

THE CAUSE OF ACCIDENT prevention in the cement mills and quarries of the Northwest was given no small amount of impetus at the annual safety meeting of the Oregon, Washington and British Columbia cement plants, held at Hotel Washington, Seattle, on Tuesday, September 9.



C. N. Reitze, chairman on arrangements

In attendance were representatives of British Columbia Cement Co., Ltd., Bamberton, B. C., International Portland Cement Co., Ltd., Irvin, Wash., Northwestern Portland Cement Co., Grotto, Wash., Olympic Portland Cement Co., Bellingham, Wash., Oregon Portland Cement Co., Oswego and Lime, Ore., Pacific Coast Cement Co., Seattle, Wash., and Superior Portland Cement, Inc., Concrete, Wash.

C. N. Reitze, vice-president and general manager of Superior, acted as chairman of the committee on arrangements. Assisting him were John G. Schoening of the U. S. Bureau of Mines; Will Cameron, Olympic; Darwin Meisnest, Pacific; Ray A. Young, Northwestern, and Gordon Tongue, Superior.

The meeting opened with a stirring address by Mayor Frank Edwards of Seattle, himself a safety engineer of long experience. Mayor Edwards indicated his interest in industrial as well as public safety and highly complimented the cement industry in its efforts to stamp out injury to its workmen.

Interesting Program Arranged

Other speakers who addressed the morning session included A. J. R. Curtis of the Portland Cement Association with a report on the recent accident record of the northwestern mills, comparing the latter with the experience over the industry as a whole: H. T. Brewer, superintendent of the International mill at Spokane, read a paper on "The Prevention of Electrical Accidents," after which Ben Hammond, safety engineer of the Olympic Portland Cement Co. at Bellingham spoke on "Common Sense Safety."

David H. Leche, general superintendent of the Oregon Portland Cement Co., read a paper on "Eliminating Lost Time Caused by Strains, Falls and Bruises," and he was followed by George C. Hewitt, industrial agent of the Pacific Coast Cement Co., who spoke on "The Foreman's Responsibility in Safety." C. E. Hutchinson, packing department foreman of Superior Portland Cement, Inc., at Concrete, Wash., talked on "Safety in Storing, Packing and Shipping."

W. P. Cameron, sales manager of the Olympic Portland Cement Co., Seattle, served as luncheon chairman, introducing as the speaker for the occasion Hon. Claire Bowman, director of the department of labor and industry of the state of Washington. Mr. Bowman recalled the splendid record of the Washington mills and highly complimented the companies on their continued desire to further reduce their mishaps.

Superior First-Aid Team Wins Contest

The afternoon session was given over almost entirely to a very spirited first-aid contest. Arrangements for the contest had been made by John G. Schoening, chief of the northwest station of the U. S. Bureau of Mines at Seattle, assisted by S. H. Ash, mining engineer of the bureau, Battalion Chief John McCloud of the Seattle fire department and H. H. Sanderson of the Sanderson Safety Supply Co. The judges consisted of a group of officers of the Seattle fire department under Chief McCloud. The four competing teams represented the following companies, the scores attained by each being as given:

Superior Portland Cement, Inc.	95.2
Pacific Coast Cement Co.	94.2
Oregon Portland Cement Co. (Oswego plant)	93.8
Olympic Portland Cement Co.	91.2

The winning team was awarded a trophy presented by Mr. Sanderson, and it was announced that a similar contest would be conducted in 1931 with all of the 1930 teams determined to attain first place.

The annual safety dinner of the northwest mills in the evening was one of the most enjoyable affairs of its kind ever held on the coast. N. D. Moore, vice-president of the Pacific Coast Cement Co., acted as toastmaster. Principal addresses were made by Wylie Hemphill, president of the Seattle Chamber of Commerce, and James H. Kane, prominent attorney and director of Superior. L. C. Newlands, president of the Portland Chamber of Commerce, and vice-president of the Oregon company, and John P. Hartman of Seattle, a director of the International company of Spokane, also spoke briefly.

Registration at Seattle Regional Safety Meeting

British Columbia Cement Co., Bamberton, B. C.: Henry J. Kidd, machinist, and Victor A. Zellinsky, kiln operator.

International Portland Cement Co., Ltd., Irvin, Wash.: H. T. Brewer, superintendent; J. P. Hartman, director (Seattle); F. W. Sandoz, quarry superintendent (Bossburg), and Homer T. Smith, machinist.

Northwestern Portland Cement Co., Grotto, Wash.: Ray A. Young.

Olympic Portland Cement Co., Bellingham, Wash.: H. W. Bennett, repairman; W. P. Cameron, manager (Seattle); William Chesney, miller; Ben Hammond, safety engineer; R. H. Kendall, miller; A. F. Krabbe, general superintendent; F. W. Lutier, oiler; F. E. Ristine, quarry superintendent; Charles Shepard, general foreman; S. P. Sprass, finish miller; G. M. Watson, foreman, and Frank Zettle, foreman.

Oregon Portland Cement Co.: J. H. Adams, chief miller, Oswego, Ore.; Theo. F. Anderson, burner, Lime, Ore.; J. B. Bywater, superintendent of quarries, Dallas, Ore.; W. K. Douglas, office manager, Lime, Ore.; G. W. Griffy, burner, Oswego, Ore.; H. E. Johnson, machinist, Oswego, Ore.; David H. Leche, general superintendent, Portland, Ore.; A. J. Lick, yard foreman, Oswego, Ore.; A. W. Martin, Jr., general foreman, Oswego, Ore.; Robert Meyers, Oswego, Ore.; L. C. Newlands, vice-president, Portland, Ore., and H. R. Shipley, superintendent, Oswego, Ore.

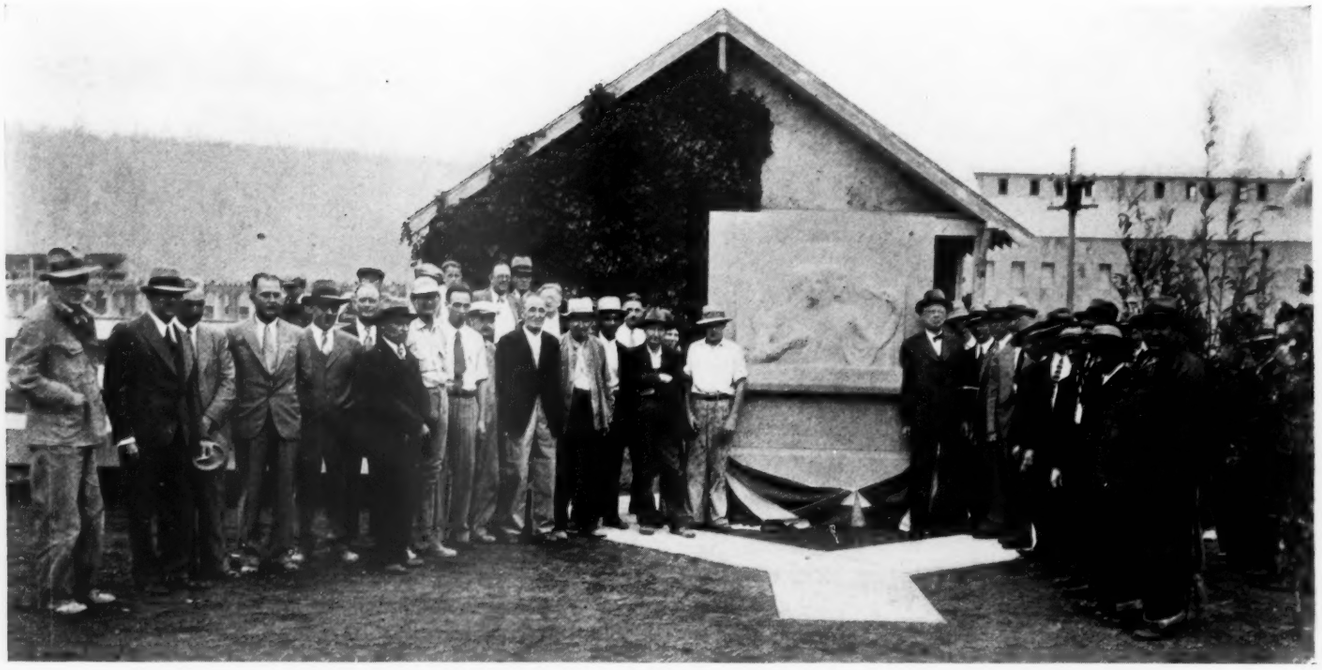
Pacific Coast Cement Co., Seattle, Wash.: J. Bratschi, mill foreman; G. O. Brooks, laboratory; F. P. Brown, yard foreman; L. D. Brown, mill foreman; A. B. Cralle, first-aid man; Allan A. Good, first-aid man; E. W. Graham; W. H. Green, plant manager; D. S. Hanley, assistant to vice-president; George C. Hewitt, industrial engineer; Harry Keegan; Darwin Meisnest, sales manager; N. D. Moore, vice-president; N. H. Nelson, chief chemist; Edwin B. Pugh; John Rask, electrician; W. N. Roderick; F. A. Schultz, electrical foreman; V. L. Smith, shift foreman; Frank Wagner, mill foreman, and H. M. Watkins, secretary-treasurer.

Superior Portland Cement, Inc., Concrete, Wash.: John Bitonti, repairman; H. G. Carleton, assistant traffic manager; G. E. Dickinson, vice-president; C. A. Geoken, machinist; Blake Hall, sack sorter; Oscar Haussler, electrician; E. B. Holbert, Jr., quarryman; C. E. Hutchinson, foreman; C. T. Jungbloom, crane operator; W. F. Jungbloom, cement packer; W. L. Jungbloom, sack department; James H. Kane, attorney; R. A. Lang, quarry foreman; Jack B. Longhary, assistant sales manager; E. P. Lucas, president; Frank C. Mars, electrician; Edward McKinney, carpenter foreman; W. B. Mitchell, repairman; Ole Nelson, welding department; C. N. Reitze, vice-president and general manager; Gordon Tongue, treasurer; C. L. Wagner, vice-president in charge of operation; J. R. Whitehair, water works; Wm. E. Woodworth, chief electrician, and Ross Zongrone, foreman.

Portland Cement Association: Frank J. Barrett, district engineer, Seattle, and A. J. R. Curtis, assistant to general manager, Chicago.

U. S. Bureau of Mines: John G. Schoening, division engineer, and S. H. Ash, mining engineer.

Others: Walter A. Averill, editor, Pacific Builder and Engineer, Seattle; M. W. Bean, editor, Daily Journal of Commerce, Seattle; D. C. Botting, engineer-secretary, Federated Industries of Washington, Seattle; Claire Bowman, director, Department of Labor and Industry, State of Washington, Olympia, Wash.; Ray S. Brown, district manager, Bates Valve Bag Co., Seattle; Frank Edwards, mayor, City of Seattle; D. Fleishman, manager, Bates Valve Bag Co., San Francisco; Wylie Hemphill, president, Seattle Chamber of Commerce; H. G. Jacobsen, Bates Valve Bag Co., Chicago; H. H. Sanderson, president, Sanderson Safety Supply Co., Seattle.



Scene at the unveiling and dedication of safety trophy, International Portland Cement Co., Irvin, Wash.

Spokane Mill Dedicates Trophy

International Portland Cement Co., Ltd., Celebrates No-Accident Award September 7

THE handsome cast stone safety monument presented to the International Portland Cement Co., Ltd., of Spokane by the Portland Cement Association for an accident-free record during 1929 was unveiled and dedicated on Saturday afternoon, September 7, at the plant, located at Irvin, Wash., a suburb of Spokane.

H. M. Heleniak, secretary and sales manager of the International company, presided, and the employes of the company, their families, residents of the Spokane valley and invited guests made up a party of several hundred persons who witnessed the dedication. Among the group of the leading officials presented were W. G. Perrow, district manager, and H. H. Helwig, superintendent of the Lehigh Metalline Falls plant.

Assistant General Manager Curtis of the association made the presentation, saying:

"Until recently it was conceded that any cement plant had to have accidents and many of them in the ordinary process of making cement. Those who are familiar with the hazards of cement making marvel that any plant could operate a year or even a much shorter period without an accident serious enough to cause even a day's loss of time to a single workman. The Spokane plant, in operating throughout 1929 without a lost-time accident, takes its place at the head of the American cement industry, and as this industry had the lowest accident rate of any American industry last year, your organization should be recognized as the safety leaders of American industry.

"The Portland Cement Association hopes that this trophy, bearing new inscriptions for future perfect records, will remain as a constant inspiration and reminder."

The monument was then unveiled by Miss Francene Briggs, teacher of the school at Irvin, and was accepted by John P. Hartman of Seattle, one of the original directors of the International Portland Cement Co. and still a member of the board.

"This honor is to you, the men now before us, who each thought more of the safety of the man next to him than possibly himself," Mr. Hartman said. "It was teamwork and co-operation that made possible a year without loss of time by accident. Rarely is this done, and it was done solely because first the superintendent at the mill and quarry saw that every safety device possible was provided, and then you men at mill and quarry watched and watched so that no one was injured."

Chairman Heleniak read congratulatory telegrams from J. B. John, chairman of the committee on accident prevention of the Portland Cement Association, and C. A. Irvin of Chicago, vice-president of the Alpha Portland Cement Co., who was the first general manager of the International Portland Cement Co. Irvin station at the cement plant was named after him.

After the dedication the party adjourned to the school house at Irvin, where a luncheon was served by the company.

Announce New Members

NEW MEMBERS joining the Quarry Section of the National Safety Council are: Granite Rock Co., 20 Maple Avenue, Watsonville, Calif.; Tavern Rock Sand Co., Klondike, Mo.; Tavern Rock Sand Co., Millville, N. J.; West Penn Cement Co., 223 Main Street, Butler, Penn.; National Lime and Stone Co., Buckeye-Commercial Bank Bldg., Findlay, Ohio, and Ohio Marble Co., 119 Bridge Street, Piqua, Ohio.

Industrial Health Discussed

DOCTORS, nurses and safety men should be interested in the proceedings of the Industrial Health and Industrial Nursing divisions of the National Safety Council held during the fall of last year in Chicago and which has just been published.

Some Things That Have No Place in the Plant

FINGER RINGS should not be worn in the plant.

Key rings and chains also should be left in the locker room or kept in the pockets.

Celluloid cap visors, eye shades and spectacle frames of the same material are also dangerous because of the fire hazard.

Little things? Why of course they are—but last year's accident experience in American industry shows there were many cases where these same little items led to aggravated injury.—National Safety Council *Safe Worker*.

Pension Credit Allowed 4000 Former Atlas Cement Employes

FULL PENSION benefit for their whole period of continuous service with the former Atlas Portland Cement Co., whose properties, assets and business were acquired by the United States Steel Corp. in January, will be extended to Atlas workers now continuing with the Universal Atlas Cement Co., a steel corporation subsidiary. This decision, according to recent announcement by the Universal Atlas company, places in line for pension benefits approximately 4000 former Atlas employes, many of whom thus get credit for 25 or more years of work with the former firm.

The United States Steel Corp. pension fund, introduced in 1910 by the corporation and Andrew Carnegie jointly, was one of the first general pension plans established in American industry. Its benefits are apportioned according to a sliding scale based on wages and length of service. The new ruling means that former Atlas men will receive pension credit for continuous service including not only the period since January, but all continuous service with the former Atlas company.

The pension plan involves the retirement of men who have served 25 years or more, usually at age of 70; by request, at 65 or thereafter; and at any age, through permanent incapacity.

August Cement Plant Accidents

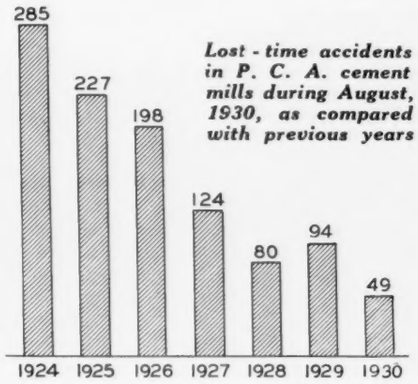
AUGUST ACCIDENTS in the cement mills and quarries again show a substantial decline, according to figures just compiled by the Portland Cement Association. In comparison with August, 1929, the record of the corresponding month this year was extremely good, although it will be noted from the accompanying diagram that August of last year was out of line with respect to the decreases achieved during the preceding five years.

During August, 1930, there were 45 lost-time accidents. The corresponding number during August of a year ago was 85. It appears that the former accidents were relatively about as severe as the latter, although it is too early as yet to make an accurate comparison. During August, 1930, there were six permanent disability accidents, a very disproportionate number, most of them suffered without any visible cause other than carelessness.

August, 1929, produced a shocking volume of fatal accidents—nine. By comparison, August, 1930, was much better, with four fatals. But the fatals of August, 1930, are very much in excess of the average rate (about 2½ per month for the year) and only four months in the last five years have recorded against them a greater number. A short description of each of the four fatal accidents follows:

A laborer loading rock at the foot of a 40-ft. quarry face was struck by a fragment of rock which fell off the top of the wall, fracturing his skull, causing immediate death.

A repairman working on a rock elevator at the bottom of the elevator pit was wound about the sprocket shaft when someone



started the elevator. He was found in a dying condition a few minutes later. Before starting for the pit to replace a broken pin in the bottom of the elevator, he had failed to lock the starting switch as warned and as required by safety regulations. No one will admit having started the elevator.

Two employes were killed by a coal tank explosion when they attempted to investigate a smouldering fire in a tank. An assistant superintendent and a coal miller lifted the manhole cover, admitting oxygen which seems to have caused the fatal blast. Both died of burns on the day following.

Universal Atlas Appointments

THE TRANSFER of E. M. Johnson, assistant treasurer, from Pittsburgh to Chicago, and the appointment of A. B. Wells, assistant eastern credit manager at Pittsburgh for twelve years, to be assistant treasurer there, has been announced by T. E. O'Connor, treasurer of the Universal Atlas Cement Co., a subsidiary of the United States Steel Corp., Chicago, Ill.

Mr. Johnson became assistant treasurer of the company last year after twelve years as eastern credit manager and after 23 years' connection with the company. Prior to that time he was for several years with the Illinois Steel Co., also a steel corporation subsidiary. He is no stranger in Chicago, having been assistant credit manager at the company's main office before going to Pittsburgh, and having previously done special advanced accounting work at Northwestern university. In returning to Chicago he succeeds A. J. Joyce, assistant treasurer, who recently resigned.

Mr. Wells has spent 29 years in United States Steel Corp. employ, 21 years being in the Universal Atlas office at Pittsburgh. Previously he was connected with the Carnegie Steel Co., and the H. C. Frick Coke Co., both steel corporation subsidiaries.

A. J. Joyce Joins Materials Service Corp., Chicago

A. J. JOYCE, for 24 years connected with various subsidiaries of the United States Steel Corp., has accepted the position of assistant to the president of the Material Service Corp., Chicago, Ill., according to an announcement by Henry Crown, president of that company. He began his duties on September 20.

The Material Service Corp. was organized eleven years ago and is now one of the largest dealers in building materials in the Chicago district. It operates ten yards in the city and in outlying sections other than its producing plants.

"Mr. Joyce's entire business experience has been in the building material field," said Mr. Crown, "and he is well fitted for his new work in the executive department of our corporation. He was connected with the Illinois Steel Co., a subsidiary of the Steel corporation, for seven years and with the Illinois Steel Warehouse Co., another subsidiary, for two years. Before his connection with these subsidiaries Mr. Joyce for four years was associated in a reportorial capacity with Chicago daily newspapers.

"For fifteen years he was with the Universal Portland Cement Co., another Steel corporation subsidiary, and was assistant treasurer of the Universal Atlas Cement Co. when he resigned some weeks ago."

Projected New Airports

ESTABLISHMENT OR IMPROVEMENT of 15 municipal, commercial, and private airports is contemplated, the Aeronautics Branch of the Department of Commerce has just announced in a statement which follows in full text:

Cities contemplating municipal airports are followed by the letter M; commercial projects by the leter C; and private projects by the letter P. Names with asterisk (*) indicate airports already established for which improvements are contemplated or under way.

Fitzgerald, Ga. (C); Ottumwa, Iowa (C); *Andover, Me. (M); *Presque Isle, Me. (C); Milo, Me. (M); Clarksdale, Miss. (M); Troy, N. Y. (C); *Grand Forks, N. Dak. (M); Lawrenceburg, Tenn. (M); Manchester, Tenn. (M); McMinnville, Tenn. (M); Eagle Pass, Tex. (M); Harlingen, Tex. (M); Middlebury, Vt. (M); *Springfield, Vt. (M).

During the past week information was received to the effect that the municipalities which follow should be deleted from the list of "proposed airports" carried in Aeronautics Bulletin No. 5, as the cities in question have either established the airports or the projects have been indefinitely postponed:

Airports established: Waynesboro, Penn.; Beaufort, S. C.; Longview, Wash.

Projects indefinitely postponed: Huntington, Ind.; Frostburg, Md.

Portland Cement Output in August

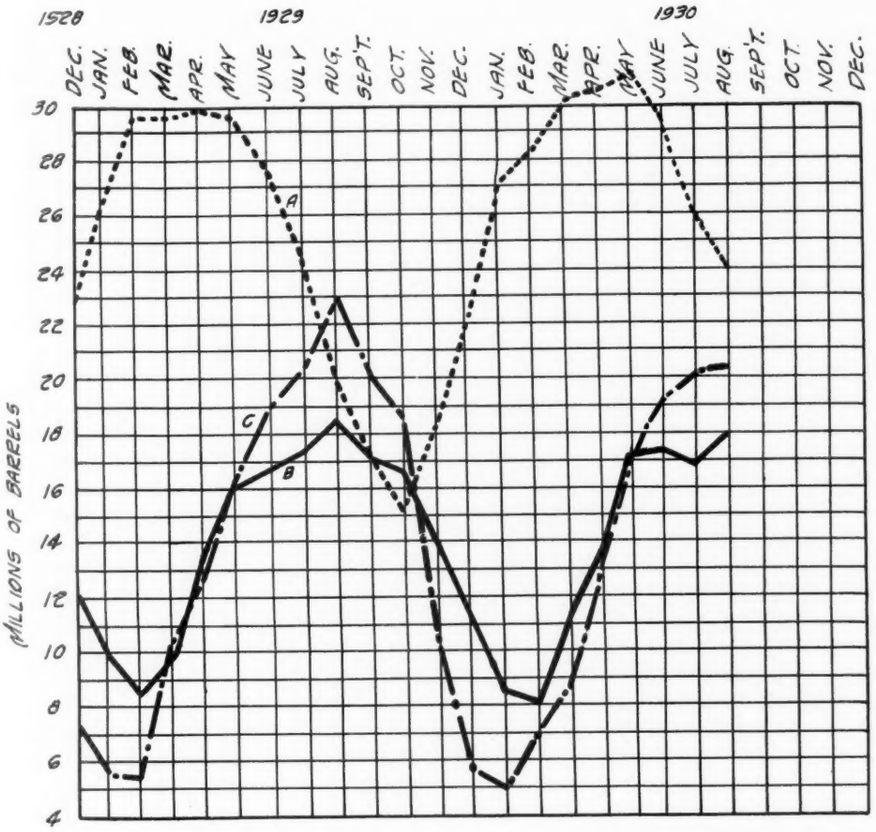
THE PORTLAND CEMENT industry in August, 1930, produced 17,821,000 bbl., shipped 20,299,000 bbl. from the mills and had in stock at the end of the month 23,810,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in August, 1930, showed a decrease of 4.1% and shipments a decrease of 11.9%, as compared with August, 1929. Portland cement stocks at the mills were 18.7% higher than a year ago.

The statistics here presented are compiled from reports for August from all manufacturing plants except two, for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 166 plants at the close of August, 1930, and of 164 plants at the close of August, 1929. In addition to the capacity of the new plants which began operating during the 12 months ended August 31, 1930, the estimates include increased capacity due to extensions and improvements at old plants during the period.

RELATION OF PRODUCTION TO CAPACITY

	Aug. 1929 Pct.	Aug. 1930 Pct.	July 1930 Pct.	June 1930 Pct.	May 1930 Pct.
The month	86.1	81.0	77.8	81.4	78.9
12 months ended	68.2	65.6	66.1	66.4	66.2



(a) Stocks of finished portland cement at factories; (b) production of finished portland cement; (c) shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments by states during June and July, 1929 and 1930:

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN JUNE AND JULY, 1929 AND 1930, IN BARRELS*

Shipped to	1929—June	1930	1929—July	1930
Alabama	156,828	124,375	227,381	137,184
Alaska	1,564	2,961	2,307	1,774
Arizona	76,157	41,057	46,241	34,382
Arkansas	149,067	175,644	181,615	184,225
California	981,611	844,399	905,437	846,508
Colorado	105,289	†110,203	107,528	92,898
Connecticut	192,236	191,348	213,551	191,178
Delaware	45,544	59,042	43,016	68,752
District of Columbia	110,966	80,561	118,426	87,492
Florida	91,946	89,285	99,338	105,993
Georgia	117,783	142,722	157,113	147,652
Hawaii	22,254	15,182	21,348	18,164
Idaho	31,802	31,356	33,383	51,059
Illinois	1,780,688	1,212,319	1,835,790	1,495,891
Indiana	635,341	820,836	745,533	864,425
Iowa	728,393	1,126,961	809,784	1,184,588
Kansas	229,267	245,344	225,611	226,827
Kentucky	164,656	115,398	187,060	223,147
Louisiana	113,837	306,306	117,311	308,306
Maine	65,594	89,475	73,594	95,005
Maryland	244,635	267,222	305,219	274,298
Massachusetts	293,455	286,925	335,635	324,874
Michigan	1,486,439	1,164,439	1,677,282	1,253,055
Minnesota	456,148	627,906	478,941	647,064
Mississippi	73,548	51,847	109,161	66,721
Missouri	567,722	727,279	725,967	737,463
Montana	82,861	†42,565	67,366	37,429
Nebraska	152,570	†235,023	150,214	210,545
Nevada	14,091	16,830	10,841	15,694
New Hampshire	73,359	75,978	98,708	80,647
New Jersey	909,551	763,411	877,662	788,857
New Mexico	32,003	†30,382	25,281	31,722
New York	2,493,401	2,331,986	2,596,425	2,474,955
North Carolina	179,957	111,543	171,148	108,620
North Dakota	81,746	63,127	69,425	53,178
Ohio	1,192,848	1,119,351	1,236,231	1,294,504
Oklahoma	286,697	353,241	323,528	362,973
Oregon	95,717	99,177	101,161	116,047
Pennsylvania	1,467,886	1,793,487	1,565,726	1,915,236
Porto Rico	2,800	250	7,702	8,250
Rhode Island	72,067	75,394	73,134	66,903
South Carolina	126,369	83,713	140,609	185,517
South Dakota	64,846	73,344	61,786	82,598
Tennessee	†341,140	284,045	†435,944	267,623
Texas	675,511	630,469	741,455	644,850
Utah	59,003	†47,830	43,737	38,485
Vermont	130,517	72,329	145,097	112,145
Virginia	187,160	156,599	194,236	182,631
Washington	244,546	347,994	263,893	330,911
West Virginia	153,996	174,962	194,649	199,923
Wisconsin	786,307	751,985	823,678	810,875
Wyoming	27,961	†25,877	21,230	23,380
Unspecified	†21,536	5,268	†40,750	
	18,879,216	18,716,552	20,265,188	20,113,423
Foreign countries	69,784	64,448	53,812	39,577
Total shipped from cement plants	18,949,000	18,781,000	20,319,000	†20,153,000

*Includes estimated distribution of shipments from three plants in June and July, 1929; from two plants in June and July, 1930.
†Revised.

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1929 AND 1930, IN BARRELS

Month	1929—Production	1930	Stock at end of month 1929	1930
January	12,012,000	10,504,000	9,642,000	9,646,000
February	11,255,000	10,008,000	12,436,000	11,572,000
March	12,450,000	13,045,000	14,948,000	13,503,000
April	14,166,000	15,025,000	15,479,000	15,164,000
May	15,444,000	16,607,000	14,911,000	14,668,000
June	15,312,000	15,895,000	13,587,000	13,452,000
July	15,214,000	*15,067,000	11,619,000	*11,682,000
August	15,829,000	15,237,000	8,995,000	9,302,000
September	15,165,000		7,009,000	
October	15,515,000		5,934,000	
November	14,087,000		6,134,000	
December	12,539,000		7,526,000	

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN AUGUST, 1929 AND 1930, AND STOCKS IN JULY, 1930, IN BARRELS

District	Production 1929—August—1930		Shipments 1929—August—1930		Stocks at end of month 1929	1930	Stocks at end of July, 1930*
Eastern Penn., N. J., Md.	3,941,000	3,676,000	4,584,000	4,161,000	4,777,000	5,506,000	5,992,000
New York and Maine	1,449,000	1,396,000	1,747,000	1,560,000	1,467,000	1,298,000	1,462,000
Ohio, West'n Penn., W. Va.	2,180,000	2,009,000	2,464,000	2,338,000	3,152,000	3,194,000	3,523,000
Michigan	1,582,000	1,426,000	2,290,000	1,627,000	1,238,000	2,418,000	2,618,000
Wis., Ill., Ind. and Ky.	2,425,000	2,409,000	3,275,000	3,045,000	2,318,000	3,295,000	3,931,000
Va., Tenn., Ala., Ga., Fla., La.	1,450,000	1,232,000	1,644,000	1,328,000	1,623,000	1,794,000	1,889,000
East'n Mo., Ia., Minn., S. D.	1,578,000	1,933,000	2,589,000	2,491,000	2,081,000	1,937,000	2,495,000
Western Mo., Neb., Kansas, Okla. and Ark.	1,430,000	1,361,000	1,773,000	1,412,000	926,000	1,637,000	1,688,000
Texas	707,000	697,000	786,000	634,000	466,000	627,000	564,000
Colo., Mont., Utah, Wyo., Ida.	357,000	302,000	368,000	292,000	518,000	510,000	501,000
California	1,128,000	922,000	1,123,000	961,000	997,000	1,104,000	1,144,000
Oregon and Washington	358,000	458,000	409,000	450,000	493,000	490,000	482,000
	18,585,000	17,821,000	23,052,000	20,299,000	20,056,000	23,810,000	26,289,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1929 AND 1930, IN BARRELS

Month	1929—Production—1930		1929—Shipments—1930		Stocks at end of month 1929	1930
January	9,881,000	8,498,000	5,707,000	4,955,000	26,797,000	27,081,000
February	8,522,000	8,162,000	5,448,000	7,012,000	29,870,000	28,249,000
March	9,969,000	11,225,000	10,113,000	8,826,000	29,724,000	30,648,000
April	13,750,000	13,521,000	13,325,000	13,340,000	30,151,000	30,867,000
May	16,151,000	17,249,000	16,706,000	17,224,000	29,624,000	30,891,000
June	16,803,000	17,239,000	18,949,000	18,781,000	27,505,000	29,364,000
July	17,315,000	*17,078,000	20,319,000	*20,153,000	24,525,000	*26,289,000
August	18,585,000	17,821,000	23,052,000	20,299,000	20,056,000	23,810,000
September	17,223,000	.....	19,950,000	.....	17,325,000	.....
October	16,731,000	.....	18,695,000	.....	15,381,000	.....
November	14,053,000	.....	11,222,000	.....	18,213,000	.....
December	11,215,000	.....	5,951,000	.....	23,550,000	.....
	170,198,000	.....	169,437,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN AUGUST, 1929 AND 1930, IN BARRELS

District	1929—Production—1930		Stocks at end of month 1929	1930
Eastern Pennsylvania, New Jersey and Maryland	3,544,000	3,273,000	1,653,000	1,610,000
New York and Maine	1,114,000	1,136,000	704,000	496,000
Ohio, Western Pennsylvania and West Virginia	1,742,000	1,511,000	878,000	972,000
Michigan	1,339,000	1,092,000	804,000	1,027,000
Wisconsin, Illinois, Indiana and Kentucky	1,788,000	1,859,000	967,000	1,380,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,240,000	1,220,000	816,000	917,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,384,000	1,608,000	667,000	587,000
Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas	1,216,000	1,271,000	414,000	276,000
Texas	770,000	701,000	255,000	299,000
Colorado, Montana, Utah, Wyoming and Idaho	263,000	342,000	365,000	270,000
California	1,121,000	860,000	1,005,000	1,020,000
Oregon and Washington	308,000	364,000	467,000	448,000
	15,829,000	15,237,000	8,995,000	9,302,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1929 AND 1930

Month	1929—Exports—1930 Barrels	Value	Barrels	Value	1929—Imports—1930 Barrels	Value	Barrels	Value
January	78,639	$283,002	82,387	$293,135	151,302	$177,976	201,609	$207,461
February	58,886	225,590	64,267	217,798	118,930	123,123	114,455	119,717
March	69,079	235,164	117,563	357,896	131,909	112,788	43,622	59,981
April	64,145	218,316	57,419	200,217	89,668	114,281	140,871	178,226
May	57,955	219,366	57,423	198,170	200,646	267,854	94,696	111,998
June	96,055	287,612	82,077	223,639	203,545	228,170	55,356	74,370
July	71,992	247,177	47,082	166,577	182,098	199,960	12,404	20,973
August	60,013	225,762	.....	.....	183,938	199,403	.....	.....
September	86,268	308,631	.....	.....	112,372	152,239	.....	.....
October	101,359	337,839	.....	.....	172,566	187,504	.....	.....
November	53,378	198,197	.....	.....	96,568	95,844	.....	.....
December	88,403	297,255	.....	.....	84,358	79,098	.....	.....
	886,172	$3,083,911	.....	.....	1,727,900	$1,938,240	.....	.....

New Canadian Self-Unloading Boat for Transporting Bulk Cement

THE 3000-ton Diesel-engine-powered vessel *Cementkarrier*, which arrived at Montreal, Que., August 11, is one of the most novel and interesting boats so far constructed for the purpose of handling cement in bulk. It was built in England by the Furness Shipbuilding Co., Ltd., for the Canada Cement Transport Co., Montreal, a subsidiary of the Canada Cement Co., and was designed for use in carrying bulk cement from Montreal to Quebec and Halifax.

Its distinguishing features are Diesel engine power with electric-motor drives and the use of the Fuller-Kinyon pump system for discharging the cargo.

Power for propelling and for unloading is obtained from two 500-hp. Atlas Diesel engines located aft and direct connected to two 360-kw. generators, which in turn drive the motor on the propeller shaft, and the motors on the unloading equipment when discharging cargo. The propeller motor is controlled from the bridge through field control of the generators.

The boat is 258 ft. long by 43 ft. wide by 20 ft. deep, and was constructed to suit this special service and to conform to the conditions imposed for passing the Canadian canal locks. Four warping winches and a snubbing winch all electric motor driven are installed for mooring and docking, and the steering gear is also electrically operated.

The cement cargo is carried in three self trimming holds of hopper formation, each divided into two compartments by a longitudinal center partition. To prevent any water leakage into the cement cargo the holds are constructed with double bottoms and sides, and are fitted with watertight latch covers. Cement is delivered into the hold by pipes from shore through small holes in the deck.

For unloading, the Leatham D. Smith tunnel scraper system is used in connection with a Fuller-Kinyon pump. The bottom of the hold is arranged with two parallel longitudinal tunnels into which the cement is allowed to flow as desired through hinged gates, and is scraped to the forward end by two 4-yd. Sauerman scrapers operated by cables and electric motor driven winches. There it falls into a hopper which feeds a 10-in. Fuller-Kinyon pump, and is carried ashore in an 8-in. pipe line. Air for this pump is supplied by two air compressors each driven by a 200-hp. motor. The winches operating the scrapers, and the Fuller-Kinyon pump, are located at the forward end of the boat and receive their power from the Diesel engine generator units. Most of the electrical equipment was furnished by the General Electric Co., Ltd., London.

Exports and Imports

These figures are compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES, IN JULY, 1930

Exported to	Barrels	Value
Canada	4,521	$19,428
Central America	4,722	12,138
Cuba	5,613	13,928
Other West Indies and Bermuda	6,952	14,302
Mexico	6,768	21,975
South America	14,036	60,205
Other countries	4,470	24,601
	47,082	$166,577

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN JULY, 1930

Imported from	District into which imported	Barrels	Value
Canada	Maine & N. H.	198	$ 626
	Vermont	7	18
	Total	205	$ 644
Denmark	Porto Rico	5,215	$ 6,638
France	New York	3,581	$ 6,298
Germany	Los Angeles	660	$ 4,032
Japan	Hawaii	253	$ 267
United K'gd'm.	New York	2,490	$ 3,094
	Grand total	12,404	$20,973

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN JULY, 1930

	Barrels	Value
Alaska	2,650	$ 6,664
Hawaii	8,975	22,398
Porto Rico	9,245	16,323
	20,870	$45,385

New Indian Cement Project

AN IMPORTANT industrial development likely to affect the cement industry in India, and affording opportunities to enterprising cement manufacturing concerns overseas, has been revealed by the Bombay Director of Industries. It is an inquiry from an important firm regarding the availability of gypsum for cement manufacture.

The Rock Products Market

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, N. J.	.....	.65	1.25	1.25	1.15	1.15
Attica and Franklinville, N. Y. (a)	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.25	1.15	1.75	.....	1.75	1.75
Buffalo, N. Y.	.....	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.75	.95	.....	1.40	.....	.....
Leeds Jct., Me., and Milton, N. H.	.....	.50	1.75	1.75	1.25	1.00
Machias Junction, N. Y.	.75	.75	.75	.....	.75	.75
Montoursville, Penn.	1.00	.75	.75	.60	.40	.40
Northern New Jersey	.20– .50	.20– .50	.50–1.25	.80–1.25	.80–1.25	.....
Scarboro, Me.	.....	1.00	2.25	2.25	2.00	2.00
Washington, D. C.	.55	.55	1.00	1.00	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.30	.20	.20	.35	.35	.40
Attica, Ind.	.....		All sizes .75–.85			
Barton, Wis.	.....	.40	.50	.60	.60	.60
Cincinnati, Ohio	.55	.55	.80	.80	.80	.80
Des Moines, Iowa	.40– .70	.40– .70	1.50–1.85	1.50–1.85	1.50–1.85	1.50–1.85
Dresden, Ohio	.....	.60	.70– .80	.75	.75	.70
Eau Claire, Wis.	.....	.40	.50	.85	.85	.....
Elkhart Lake and Glenbeulah, Wis.	.50	.30	.40	.50	.50	.50
Grand Rapids, Mich.	.40	.40	.70	.70	.70	.70
Greenville, Ohio	.50– .70	.40– .60	.50– .60	.50– .60	.50– .60	.50– .60
Hamilton, Ohio	.65– .75	.65– .75	.65– .75	.65– .75	.65– .75	.65– .75
Hersey, Mich.	.50	.....	.....	.60	.70	.70
Indianapolis, Ind.	.50– .60	.25– .60	.40– .60	.45– .75	.45– .75	.45– .75
Kalamazoo, Mich.	.....	.40– .50	.....	.45– .55	.....	.50– .75
Kansas City, Mo.	.70	.70	.....	.80	.....	.....
Mankato, Minn.	.55	.45	1.25	1.25	1.25	.....
Mason City, Iowa	.60	.60	1.25	1.25	1.25	1.25
Milwaukee, Wis.	.....	.86	.86	.96	.96	.96
Minneapolis, Minn.	.35	.35	1.35	1.35	1.35	1.25
Oxford, Mich.	.25– .35	.20– .30	.30– .40	.55– .75	.55– .75	.60– .75
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Urbana, Ohio	.65	.55	.65	.65	.65	.65
Waukesha, Wis.	.....	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.10	1.00	1.00
SOUTHERN:						
Brewster, Fla.	.40	.40	.....	.....	.....	.....
Charleston, W. Va.	.70	1.25	1.25	.....	.....	.....
Eustis, Fla.	.....	.40– .50	.....	.....	.....	.....
Fort Worth, Tex.	.80–1.00	.80–1.00	1.25–1.50	1.00–1.25	1.00–1.25	1.00–1.25
Knoxville, Tenn.	.80	1.00	1.50	1.20	1.20	1.20
Roseland, La.	.15	.15	.60	.40	.40	.....
WESTERN:						
Oregon City, Ore.	Sand for concrete, 1.00-1.50 per cu. yd. at plant					
Phoenix, Ariz.	1.25*	1.15*	1.25*	1.15*	1.15*	1.00*
Pueblo, Colo.	.80	.60	.....	1.20	.....	1.15
San Gabriel, San Fernando Valleys, Cal.	.60	.60	1.10	1.10	1.10	1.10
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*	1.00*	1.25*

*Cu. yd. ‡Delivered on job by truck. (a) Prices on trucks; on cars, 65c per ton for all sizes.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; per ton f.o.b. plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.00	2.00	2.25	1.50	.....	4.00	.....
Cheshire, Mass.	Sand for soap, 5.75–7.00					5.00	.....
Columbus, Ohio	1.50	1.50	1.35	.90	.....	3.50–4.50	.....
Dresden, Ohio	1.15–1.50	1.00–1.35	1.25–1.50	1.00–1.25	1.25	.....	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.50–3.00	.....
Elco, Ill.	Soft amorphous silica. 92%–99% thru 325 mesh, 18.00–40.00 per ton						
Kasota, Minn.	.....	.....	.....	.....	.....	.....	1.00
Montoursville, Penn.	.....	.....	.....	1.35–1.50	.....	.....	.....
New Lexington, Ohio	1.75–2.00	1.25	.....	.....	.....	.....	.....
Ohlton, Ohio	1.75*	1.75*	1.75*	2.00*	1.75*	1.75*	.....
Ottawa, Ill.	1.25–3.25	2.25–3.50	1.25–3.25	1.25–3.25	1.25	3.50	3.50
Red Wing, Minn. (a)	.....	.....	.....	.....	1.50	3.00	1.50
San Francisco, Calif.	3.50†	5.00†	3.50†	2.50–3.50†	5.00†	3.50–5.00†	.....
Silica, Va.	Potter's flint 8.00–10.00 per ton						
South Vineland, N. J.	Washed and dried silica sand, per ton, 2.25						

†Fresh water washed, steam dried. *Damp. (a) Filter sand, 3.00.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Dresden, Ohio	.....	1.00
Eau Claire, Wis.	4.30	1.00
Montoursville, Penn.	.....	1.00
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	1.25–3.25	1.25
Red Wing, Minn.	.....	1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.	.....	1.75

Glass Sand

(Silica sand is quoted washed, dried and screened)

Cheshire, Mass. (in carload lots)	5.00
Klondike, Mo.	2.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
South Vineland, N. J.	1.75
San Francisco, Calif.	4.00–5.00
Silica, Va.	2.50–3.00

Bank Run Sand and Gravel

Algonquin, Ill.¶ (½-in. and less)	.30
Buffalo, N. Y.—Sand, 1/10-in. down, 1.00; ¼-in. down, .85; gravel, all sizes	.75
Burnside, Conn. (sand, ¼-in. and less)	.75*
Fort Worth, Tex.¶ (2-in. and less)	.65– .75
Gainesville, Tex.¶ (1½-in. and less)	.55
Gary and Miller, Ind.†	1.15–1.40a
Grand Rapids, Mich.¶ (1-in. and less)	.50
Hamilton, Ohio¶ (1¼-in. and less)	50–1.00
Hersey, Mich.,¶ ½-in and less, .40; 1-in. and less	.50
Mankato, Minn.†	.70
Oregon City, Ore.—River run	1.00–1.50
Winona, Minn.†	.60
York, Penn.—Sand, 1/10-in. down, 1.10; ¼-in. and less	1.00

*Cubic yard. †Fine sand, 1/-10-in. down. (a) Cu. yd., delivered Chicago. ¶Gravel.

***ROCK PRODUCTS** solicits volunteers to furnish accurate price quotations.*

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.92½	3.70	4.30¶
Atlanta, Ga.	.....	2.19*	3.49¶
Baltimore, Md.	.....	2.26*	3.56¶
Berkeley, Calif.	.....	2.14	.....
Birmingham, Ala.	.....	1.85*	3.15¶
Boston, Mass.	.47	1.88*	3.27¶
Buffalo, N. Y.	.61¼	2.05*	3.35¶
Butte, Mont.	.90¼	3.61	.....
Cedar Rapids, Ia.	.....	2.23*	.....
Centerville, Calif.	.....	2.14	.....
Charleston, S. C.	.....	a2.29†	3.26¶
Cheyenne, Wyo.	.71½	2.86	.....
Chicago, Ill.	.....	1.95*	3.25¶
Cincinnati, Ohio	.....	2.14*	3.44¶
Cleveland, Ohio	.....	2.04*	3.34¶
Columbus, Ohio	.....	2.12†–2.17*	3.47¶
Dallas, Texas	.....	1.90*	3.49¶
Davenport, Iowa	.....	2.14*	.....
Dayton, Ohio	.....	2.14*	3.44¶
Denver, Colo.	.76½	2.95	.....
Des Moines, Iowa	.48½	2.29*	.....
Detroit, Mich.	.....	1.95*	3.25¶
Duluth, Minn.	.....	2.04*	.....
Fresno, Calif.	.....	2.33	.....
Houston, Texas	.....	2.00*	3.73¶
Indianapolis, Ind.	.54¼	1.99*	3.29¶
Jackson Miss.	.....	2.29*	3.59¶
Jacksonville, Fla.	.....	*2.16–b2.34†	3.46¶
Jersey City, N. J.	.....	2.13*	3.43¶
Kansas City, Mo.	.50½	2.02*	3.22¶
Los Angeles, Calif.	.57½	2.30	.....
Louisville, Ky.	.55½	2.12*	3.42¶
Memphis, Tenn.	.....	2.29*	3.59¶
Merced, Calif.	.....	2.01	.....
Milwaukee, Wis.	.....	2.10*	3.40¶
Minneapolis, Minn.	.....	2.27*	.....
Montreal, Que.	.....	1.60‖	.....
New Orleans, La.	.43	1.92†	3.22¶
New York, N. Y.	.50¾	2.03*	3.33¶
Norfolk, Va.	.....	1.97*	3.27¶
Oklahoma City, Okla.	.61½	2.46*	3.66¶
Omaha, Neb.	.59	2.36*	3.56¶
Peoria, Ill.	.....	2.12*	3.32¶
Pittsburgh, Penn.	.....	1.95*	3.25¶
Philadelphia, Penn.	.....	2.15*	3.45¶
Phoenix, Ariz.	.....	3.51	.....
Portland, Ore.	.....	2.50‡	.....
Reno, Nev.	.....	2.96‡	.....
Richmond, Va.	.....	2.32*	3.62¶
Sacramento, Calif.	.....	2.25	.....
Salt Lake City, Utah	.70¼	2.81	.....
San Antonio, Texas	.....	.....	3.42¶
San Francisco, Calif.	.....	2.24‡	.....
Santa Cruz, Calif.	.....	2.10	.....
Savannah, Ga.	.....	a2.29†	3.16¶
St. Louis, Mo.	.48¾	1.95*	3.25¶
St. Paul, Minn.	.....	2.27*	.....
Seattle, Wash.	.....	1.75	†2.50c
Tampa, Fla.	.....	2.00†	3.41¶
Toledo, Ohio	.....	2.10*	3.50¶
Topeka, Kan.	.55¼	2.21*	3.41¶
Tulsa, Okla.	.58¼	2.33*	3.53¶
Wheeling, W. Va.	.....	2.02*	3.32¶
Winston-Salem, N.C.	.....	2.44*	3.54¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Albany, N. Y.	.....	2.15	.....
Bellingham, Wash.	.....	2.25	.....
Bonner Springs, Kan.	.....	1.85	.....
Buffington, Ind.	.....	1.70	.....
Concrete, Wash.	.....	2.65	.....
Davenport, Calif.	.....	2.05	.....
Hannibal, Mo.	.....	1.80	.....
Hudson, N. Y.	.....	1.85	.....
Independence, Kan.	.....	1.85	.....
Leeds, Ala.	.....	1.70	.....
Limedale, Ind.	.....	1.70	.....
Lime & Oswego, Ore.	.....	2.50	.....
Nazareth, Penn.	.....	2.15	.....
Northampton, Penn.	.....	1.75	.....
Richard City, Tenn.	.....	2.05	.....
Steelton, Minn.	.....	1.85	.....
Toledo, Ohio	.....	2.20	.....
Universal, Penn.	.....	1.70	.....
Waco, Tex.	.....	1.85	.....

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. *Includes dealer and cash discounts. †Includes 10c cash discount. ‡Subject to 2% cash discount. (a) 44c refund for paid freight bill. (b) 38c bbl. refund for paid freight bill. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. ‖Includes sales tax. (c) Quick-hardening "Velo."

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chazy, N. Y.	.75	1.60	1.60	1.30	1.30	1.30
Ft. Spring, W. Va.	.35	1.35	1.35	1.25	1.15	1.00
Jamesville, N. Y.	1.00	1.00	1.00	1.00	1.00	.....
Oriskany Falls, N. Y.	1.00	1.25	1.25	1.25	1.25	1.25
Prospect Junction, N. Y.	.50– .80	.....	1.00–1.15	1.00–1.10	1.00–1.10	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Hillsville, Penn.	.85	1.35	1.35	1.35	1.35	1.35
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.75	.....	1.75	.....	.....	.....
Afton, Mich.	.....	.....	.....	.25	.....	1.50
Cypress, Ill.	.....	1.00	1.00	.90	.90	.85
Davenport, Iowa	1.20	1.50	1.50	1.30	1.30	1.30
Dubuque, Iowa	1.00	1.00	1.00	1.00	1.00	.....
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05–1.70	1.05–1.70	.....
Greencastle, Ind.	1.25	1.00	.90	.90	.90	.90
Lannon, Wis.	.80	.90	.90	.80	.80	.80
McCook, Ill.	.80	1.00	1.00	1.00	1.00	1.00
Sheboygan, Wis.	1.20	1.20	1.10	1.10	.....	.....
Stone City, Iowa	.75	.....	1.10	1.00	1.00	1.00h
Toledo, Ohio	1.60	1.70	.....	1.60	.....	1.60
Toronto, Canada	2.50	3.00	2.50	2.50	2.50	2.50
Waukesha, Wis.	.....	.90	.90	.90	.90	.....
SOUTHERN:						
Cartersville, Ga.	1.15	1.35	1.35	1.15	1.00	1.00
Chico, Texas	.75	1.30	1.25	1.20	1.10	1.00
Cutler, Fla.	.50r	1.75r	1.75r	1.75r	1.75r	1.50r
El Paso, Texas	.50– .75	1.25	1.25	1.00	1.00	1.00
Olive Hill, Ky.	.50	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.40	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (t)	.25	.25	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.00	1.25	1.25	1.25	1.00	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Rock Hill, St. Louis Co., Mo.	1.30–1.40	1.30–1.40	1.10–1.40	1.30–1.40	1.30–1.40	1.30–1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn.	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Farmington, Conn.	1.00	1.30	1.30	1.00	1.00	.....
Duluth, Minn.	1.00	2.25	1.75	1.65	1.35	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.25	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.30	1.60	1.50	1.35	1.35
Knippa, Texas	1.15	1.25	1.50	1.30	1.15	1.10
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35–1.40	2.10	1.70–1.90	1.40–1.50	1.40–1.50	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Toronto, Canada	4.70	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Cayce, S. C.—Granite	.....	.....	1.60	1.60	1.50	.....
Chicago, Ill.—Granite	2.00	1.70	.....	1.50	1.50	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.—Granite	.50	1.25	1.25	1.15	1.15	.....
Lohrville, Wis.—Granite	1.80	1.60	.....	1.50	1.50	.....
Middlebrook, Mo.—Granite	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
San Gabriel and San Fernando Valleys, Calif. (Granite)	.....	1.30	1.30	1.30	.....	1.30
(Basalt)	.....	.....	.....	.85	.....	.....
Toccoa, Ga.—Granite	.50	.....	1.30	1.25	1.20	1.15

(c) 1-in., 1.40. (d) 2-in., 1.30. (h) Rip rap. (n) Ballast, R. R., .90; run of crusher, 1.00. (r) Cu. yd. (t) Rip rap, 1.20–1.40 per ton.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Allentown, Penn.	1.00–1.50	.40– .60	.80–1.00	.50– .80	.50– .80	.60– .80	.80
Bethlehem, Penn.	1.25–1.50	.50– .60	1.00	.60– .80	.70– .80	.70– .90	.90
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Reading, Penn.	2.00	1.00	.....	1.00	.....	.....	.....
Swedeland, Penn.	1.50–2.50	.60–1.10	1.00–1.25	.90–1.25	.90–1.25	1.25	1.25
Western Pennsylvania	2.00	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	.....
Jackson, Ohio	2.05*	.65*	1.80*	1.30*	1.30*	1.30*	.....
Toledo, Ohio	1.50	1.10	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.	2.05*	1.05*	1.65*	1.45*	1.45*	1.45*	.....
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05*	.55*	.....	1.15*	.90*	.90*	.....

5c per ton discount on terms. †1½-in. to ¼-in., 1.05; ⅝-in. to 10 mesh, 1.25*; ⅝-in. to 0-in., 90c*; ¼-in. to 10 mesh, .80*.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 99% $CaCO_3$; 0.3% $MgCO_3$, 90% thru 100 mesh 4.50
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh 1.50
Carterville, Ga. 2.00
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton 6.00
Gibsonburg, Ohio—Bulk, 2.25; in bags 3.70
Jamesville, N. Y.—Bulk, 3.50; in 80-lb. bags 4.75
Joliet, Ill.—Analysis, 50% $CaCO_3$; 44% $MgCO_3$; 90% thru 200 mesh 3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, bags, 3.75; bulk 2.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton 2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh 4.25
Atlas, Ky.—90% thru 4 mesh, 50c; 90% thru 100 mesh 1.00
West Rutland, Vt. — Analysis, 96.5% $CaCO_3$; 1% $MgCO_3$, in 100-lb. burlap bags, per ton 4.50

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98.44% $CaCO_3$; .83% $MgCO_3$; 90% thru 10 mesh 1.50
Cartersville, Ga.—50% thru 50 mesh 1.50
Chico, Tex.—(Agstone, ⅛-in. down), per ton 1.00
Colton, Calif.—Analysis, 95-97% $CaCO_3$; 1.31% $MgCO_3$, all thru 14 mesh down to powder 3.50
Cypress, Ill. — Analysis, 96% $CaCO_3$; 90% thru 100 mesh, 1.25; 50% thru 100 mesh, 1.15; 90% thru 50 mesh, 1.15; 50% thru 50 mesh, 1.15; 90% thru 4 mesh, 1.15, and 50% thru 4 mesh 1.15
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk, per ton 1.20
Dubuque, Ia.—Analysis, 64.04% $CaCO_3$; 29.54% $MgCO_3$; 50% thru 100 mesh .. 1.10
Dundas, Ont.—Per ton 1.00
Fort Spring, W. Va.—Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 50% thru 100 mesh; bulk, per ton 1.15
Gibsonburg, Ohio—90% thru 10 mesh 1.00–1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh, sacked 5.00
Lannon, Wis. — Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh 2.00
Screenings (¼-in. to dust) 1.00
Marblehead, Ohio—90% thru 100 mesh 3.00
90% thru 50 mesh 2.00
90% thru 4 mesh 1.00
Marlbrook, Va.—Precipitated lime-marl. Analysis, 96% $CaCO_3$; 1% $MgCO_3$, 90% thru 50 mesh, bulk, 2.25; in burlap bags 3.75
McCook and Gary, Ill.—Analysis, 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 4 mesh ..... .80
Osborne, Penn.—100% thru 20 mesh, 60% thru 100 mesh, and 45% thru 200 mesh, per ton a5.00
Piqua, Ohio—30%, 50% and 99% thru 100 mesh 1.00–4.00
Rocky Point, Va.—50% thru 200 mesh, bulk, in carloads, 2.00; 100-lb. paper bags, 3.25; 200-lb. burlap bags 3.50
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh 1.15–1.70
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh ..... .75
West Stockbridge, Mass.* — Analysis, 95% $CaCO_3$; 90% thru 100 mesh, bulk 100-lb. paper bags, 4.75; 100-lb., cloth .. 3.50 5.25
Waukesha, Wis.—90% thru 100 mesh, 4.00; 50% thru 100 mesh 2.10
*Less 25c cash 15 days. (a) Less 50c comm.

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton .. 6.00
Hillsville, Penn.—Sacks, 5.10; bulk 3.50
Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh (bags extra) 3.50
Piqua, Ohio—99% thru 100 mesh, bulk, 3.25; in 80-lb. or 100-lb. bags 4.25
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk 2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk 4.00

Lime Products

(Carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Berkeley, R. I.	.....	.....	11.40	.....	.....	17.50	.....	20.65
Cedar Hollow, Devault, Mill Lane, Knickerbocker, Rambo and Swedeland, Penn.	.....	9.50b	9.50b	9.50b	8.00f	9.50d	8.50	.....
Lime Ridge, Penn.	.....	.....	7.50	.....	6.50	8.00[1]	4.50	.....
CENTRAL:								
Afton, Mich.	.....	.....	.....	.....	.....	10.50	6.50	.....
Cold Springs, Ohio	.....	7.75	7.75	.....	.....	.....	7.00	.....
Gibsonburg, Ohio	10.50	7.75	7.75	.....	7.00	9.00[3]	7.00	.....
Little Rock, Ark.	.....	14.40	.....	14.40	.....	.....	11.90	17.90
Luckey, Ohio*	10.50	7.75	7.75	.....	.....	.....	7.00	.....
Marblehead, Gibsonburg, Tiffin and White Rock, O., and Huntington, Ind.	10.50	7.75	7.75	11.00	7.00	9.00	7.00	.....
Milltown, Ind.	.....	9.00	8.25	9.50	7.50	.....	7.00	.....
Pittsburgh, Penn.	10.50	7.75	7.75	.....	7.00	9.00	7.00	.....
Scioto, Ohio	10.50	6.50	6.50	7.50	.....	.....	6.50	.....
Sheboygan, Wis.	.....	10.50	10.50	10.50	.....	.....	9.50	20.00e
Wisconsin points	.....	11.50	.....	.....	.....	.....	9.50	.....
Woodville, Ohio	10.50	7.75	7.75	11.50[6]	7.00	9.00[3]	7.00	15.00c
SOUTHERN:								
Cartersville, Ga.	.....	9.00	.....	.....	.....	13.50	.....	15.00
Graystone, Ala.*	12.50	9.00	.....	12.50	.....	.....	7.50	.....
Keystone, Ala.	16.00	7.00	.....	7.00– 8.00	.....	.....	5.00a	11.50
Knoxville, Tenn.	17.00	7.00	7.00	7.00	5.50	.....	5.00	23.00
Ocala, Fla.	.....	10.50	.....	.....	.....	.....	.....	.....
Pine Hill, Ky.	.....	9.00	8.00	7.50–9.00	.....	.....	6.00	12.50
WESTERN:								
Colton, Calif.	.....	.....	.....	.....	9.50[2]	.....	.....	.....
Kirtland, N. M.	.....	.....	.....	.....	.....	.....	15.00	.....
Los Angeles, Calif.	22.00	18.00	18.00	18.00	19.00	.....	19.00	21.00
San Francisco, Calif.†	20.00	20.00	12.00	20.00	.....	.....	.....	.....
San Francisco, Calif.	19.00	14.00–17.00	12.50	14.00–19.00	14.50[5]	.....	11.00[4]	.....

[1]In 100-lb. bags. [2]To 11.85 per ton, granular but not ground, ¾-in. screen down to 14 mesh. [3]In 80-lb. paper. [4]To 14.50. [5]Also 13.00. [6]Superfine, 92.25% thru 200 mesh. *Price to dealers. †Wood-burnt lime: finishing hydrate 20.00 per ton, pulv. lime 2.00 per iron drum. Oil-burnt pulv. lime, 13.00–14.50 per ton. (a) To 6.00. (b) In 50-lb. paper. (c) In wood; in steel, 16.00. (d) In 80-lb. paper bags. (e) In steel. (f) For chemical purposes.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 300 mesh, 7.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton. Granville, N. Y.—Red, green and black, $7.50 per ton.
Pen Argyl, Penn.—Blue-black, 6.50 per ton in bulk, plus 10c per bag.

Roofing Slate

	Prices per square—Standard thickness.					
City or shipping point:	3/16-in.	¼-in.	3/8-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—						
Buckingham oxford grey	13.88	17.22	24.99	29.44	34.44	45.55
Bangor, Penn.—						
Gen. Bangor No. 1 clear	10.00–14.00	20.00	25.00	29.00	40.00	50.00
Gen. Bangor No. 1 ribbon	9.00–10.25	16.00	20.00	25.00	35.00	46.00
No. 1 Albion	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Gen. Bangor No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....
Chapman Quarries, Penn.	7.75–11.25	13.00–15.00	19.00–22.00	23.00–28.00	27.00–30.00	32.00–35.00
Granville, N. Y.—						
Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green & gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple & unfading gr'n	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Pen Argyl, Penn.						
Graduated slate	.....	.....	16.00	23.00	27.00	37.00	46.00
No. 1 clear (smooth text)	7.25–10.50; Albion-Bangor medium, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mt., No. 1 & No. 2 clear	8.00– 9.50	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point

Chatsworth, Ga.:	
Crude talc, per ton	5.00
Ground talc (20-50 mesh), bags	6.50
Ground talc (150-200 mesh), bags	9.00
Pencils and steel crayons, gross	1.50– 2.00
Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh	7.50– 8.00
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of bags. Terms 1%, 10 days.	
Clifton, Va.:	
Ground talc (150-200 mesh), in bags	10.00
Conowingo, Md.:	
Crude talc, bulk	4.00
Ground talc (150-200 mesh), in bags	14.00
Cubes, blanks, per lb.	.10
Emeryville, N. Y.:	
Ground talc (200 mesh), bags	13.75
Ground talc (325 mesh), bags	14.75
Hailesboro, N. Y.:	
Ground talc (300-350 mesh), in 200-lb. bags	15.50–20.00
Henry, Va.:	
Crude (mine run), bulk	3.50– 4.50
Ground talc (150-200 mesh), bags	6.25– 9.75
Joliet, Ill.:	
Ground talc (200 mesh) in bags:	
California talc	30.00
Southern talc	20.00
Illinois talc	10.00
Los Angeles, Calif.:	
Ground talc (150-200 mesh), in bags	15.00–25.00
Natural Bridge, N. Y.:	
Ground talc (325 mesh), bags	10.00–15.00

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock	
Gordonsburg, Tenn.—B.P.L. 65-70%	3.50– 4.00
Mt. Pleasant, Tenn.—B.P.L. 76-78%	6.75
Ground Rock (2000 lb.)	
Gordonsburg, Tenn.—B.P.L. 65-68%	3.50– 4.00
Mt. Pleasant, Tenn.—Lime Phosphate: 85-90% thru 300 mesh	11.80
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00– 5.50

Florida Phosphate

(Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines	
68/66% B.P.L.	3.15
70% minimum B.P.L.	3.75
72% minimum B.P.L.	4.25
75/74% B.P.L.	5.25
77/76% B.P.L.	6.25

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	100.00–125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, Bristol and Cardigan, N. H.—Per ton:	
Punch mica, per ton	150.00–240.00
Mine scrap	22.50
Mine run	325.00
Clean shop, scrap	25.00
Roofing mica	37.50
Trimmed mica, per ton, 20 mesh, 37.50; 40 mesh, 40.00; 60 mesh, 40.00; 100 mesh, 45.00; 200 mesh	60.00
Spruce Pine, N. C.—Mine scrap, per ton	18.00–20.00
Trenton, N. J.—Mine scrap, per ton, f.o.b. mines	18.00

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

East St. Louis, Ill.—Special	Crushed Rock Gypsum	Ground Gypsum Products	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	—Plaster Board— ½x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton, floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 6 in. long, 17c per ft., 23.00 per ton.													
Grand Rapids, Mich.	.....	.....	.....	9.00	9.00	9.00	.....	.....	.....	.....	15.00	15.00	27.00
Los Angeles, Calif.	3.90	10.00	7.00–10.00	8.20	11.70	.....	11.50	10.50	40.00	10.50	.....	22.00	35.00
Medicine Lodge, Kan.	.....	.....	.....	.....	.....	.....	11.50d	.....	16.00d	.....	.....	.....	.....
Oakfield, N. Y.	3.00	.....	.....	6.00	9.00d	9.00d	.....	6.00	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	9.00	9.00	9.00	20.00	8.00	25.50	20.00i	.....	15.00	25.00
Portland, Ore.	7.50	.....	11.50d	16.00d	.....	.....	.....	.....	.....	.....	.....	.....	.....
Providence, R. I. (x)	.....	.....	.....	12.00–13.00e	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	10.20d	.....	.....	12.90	.....	13.90	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.60	.....	10.00d	14.00d	.....	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00g	33.00f

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (d) Includes paper bags. (e) Includes jute sacks. (f) "Gyproc." ⅜x48-in. by 5 and 10 ft. long. (g) ⅜x48-in. by 3 to 4 ft. long. (i) To 26.00. (x) "Fabricate" gypsum blocks, 2- and 3-in., f.o.b. motor trucks at plant, 7¼c-8¼c. Block setting plaster, per ton, in jute sacks, 12.00. (y) Jute sacks, 18.00; paper sacks, 16.00.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N. Y.—Bio-Spar, per ton in bags in carload lots, 9.00; less than carload lots, 12.00 per ton in bags; bulk, per ton		7.50
Crown Point, N. Y.—Mica Spar		¶9.00–‖12.00
Davenport, Iowa — White limestone, in bags, per ton	¶6.00	¶6.00
Harrisonburg, Va.	12.50–14.50	
Middlebrook, Mo.—Red		20.00–25.00
Middlebury, Vt. — Middlebury white		¶9.00–‖10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		c5.50
Phillipsburg, N. J.—Royal green granite, in bags, per ton		15.00–18.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits		12.00–20.00
Tuckahoe, N.Y.—Tuckahoe white	6.00	
Warren, N. H. (d)		¶8.00– 8.50

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L. (d) L.C.L., 9.50–15.00 per ton in 100-lb. bags.

Soda Feldspar

De Kalb Jct., N. Y.—Color, white; pulverized (bags extra, burlap 2.00 per ton, paper 1.20 per ton); 99% thru 140 mesh, 16.00; 99% thru 200 mesh, per ton	18.00

Potash Feldspar

Bedford, Va.—Color, white; analysis, K_2O, 12.5%; Na_2O, 2%; SiO_2, 66.5%; Fe_2O_3, 0.08-0.12%; Al_2O_3, 18.5%, crude feldspar, bulk	6.50– 7.50
Keystone, S. D.—Color, white; analysis, K_2O, 12.50%; NaO, 2.25%; SiO_2, 64%; Fe_2O_3, 0.03%; Al_2O_3, 20%, pulverized, 99% thru 200 mesh; in bags, 16.00; bulk	15.00
Crude, in bags, 7.50; bulk	6.50
Erwin, Tenn.—White; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.05%; Al_2O_3, 18.25%, pulverized, 98% thru 200 mesh, in bags, 16.00; bulk	15.00
Crude, in bags, 7.50; bulk	6.50

Cement Drain Tile

Graettinger, Iowa — Drain tile, per foot; 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in.	2.00
Grand Rapids, Mich.—Drain tile, per 1000 ft.	
4-in.	36.00
6-in.	66.00
8-in.	100.00
10-in.	150.00
12-in.	210.00
Longview, Wash.—Drain tile, per 100 ft.	
3-in.	5.00
4-in.	6.00
6-in.	10.00
8-in.	15.00
Tacoma, Wash.—Drain tile, per 100 ft.	
3-in.	4.00
4-in.	5.00
6-in.	7.50
8-in.	10.00

Chicken Grits

Cypress, Ill.—(Agstone)	1.15
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per 100-lb. sack	1.00
Cranberry Creek, N. Y.—Per ton, in carload lots, in bags, 9.00; bulk, 7.50. Less than carload lots, in bags	12.00
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
El Paso, Tex.—(Limestone), per 100-lb. sack	.75
Los Angeles, Calif.—(Gypsum), per ton, including sacks	7.50– 9.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, Ohio—(Pearl grit), No. 1 and No. 2	1.00– 4.00
Port Clinton, Ohio—(Gypsum), per ton	6.00
Randville, Mich.—(Marble), bulk	6.00
Seattle, Wash.—(Gypsum), bulk, ton	10.00
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	7.00
West Stockbridge, Mass.	‖7.50–‖9.00
Wisconsin points—(Limestone), per ton	15.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis. (at plant)	9.50
Dayton, Ohio	12.50
Detroit, Mich.	12.00d–15.50*
Farmington, Conn.	16.00
Flint, Mich.	15.50b
Grand Rapids, Mich.*	14.00
Iona, N. J.	10.50–12.00
Jackson, Mich.	13.00
Madison, Wis.	12.50a
Milwaukee, Wis.	13.00*
Minneapolis and St. Paul, Minn.	9.50*
Mishawaka, Ind.	11.00
Pontiac, Mich.	12.00
Saginaw, Mich.	13.50
San Antonio, Texas	12.00
Sebewaing, Mich. (at yard)	12.50
South River, N. J.	11.00
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada	11.00–b13.00*
Wilkinson, Fla.—White, 10.00; buff	14.00
Winnineg, Canada	15.00

*Delivered on job. (a) Less 50c disc. per M 10th of month. (b) 5% disc., 10 days. (c) Delivered in city. (d) To 13.00.

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point	Size 8x8x16
Appleton, Minn.	18.00–20.00
Franklin Park, Ill.:	
8x8x16. Per 1000	180.00
Camden, N. J.: 8x8x16, each	.18
Chicago, Ill.:	
8x 8x16. Each	.21†
8x 8x16. Each	.18b
8x10x16. Each	.25†
8x10x16. Each	.22b
8x12x16. Each	.28†
8x12x16. Each	.25b
Columbus, Ohio: 8x8x16	14.00b–16.00a
Forest Park, Ill.	21.00*
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12a
Lexington, Ky.:	
8x8x16	a18.00*
8x8x16	b15.00*
Los Angeles, Calif.:	
4x8x12	4.50*
4x6x12	3.90*
4x4x12	2.90*

*Price per 100 at plant.
†Rock or panel face.
(a) Face. (b) Plain.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French, Spanish, Closed End Shingle, and English Shingle, per sq.	9.50–13.00
Detroit, Mich.—5x8x12, per M	67.50
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Lexington, Ky.—8x15, per sq.:	
Red	15.00
Green	18.00
Longview, Wash.:	
4x6x12-in., per 1000	55.00
4x8x12-in., per 1000	65.00

Cement Building Tile

Chicago District (Haydite):	
8x 4x16, per 1000	140.00
8x 8x16, per 1000	200.00
8x12x16, per 1000	300.00
Columbus, Ohio:	
5x8x12, per 100	6.00
Lexington, Ky.:	
5x8x12, per 1000	55.00
4x5x12, per 1000	35.00
Longview, Wash. (Stone Tile):	
4x6x12, per 1000	57.50
4x8x12, per 1000	65.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Camden & Trenton, N. J.	17.00	
Chicago District "Haydite"	14.00	
Columbus, Ohio	16.00	17.00
Ensley, Ala. ("Slagtex")	10.00	
Forest Park, Ill.		37.00
Longview, Wash.	16.50	23.00– 40.00
Milwaukee, Wis.	14.00	
Omaha, Neb.	18.00	30.00– 40.00
Philadelphia, Penn.	15.50	
Portland, Ore.	12.00	22.50– 55.00
Prairie du Chien, Wis.	14.00	22.00
Rapid City, S. D.	18.00	25.00– 40.00

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.		53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.		55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	40.00	52.50	70.00
Patchogue, N. Y.		60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x 4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% discount.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10-in.	12-in.	15 in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in.
Grand Rapids, Mich. (b)																	
Sewer	.....	.12	.18	.27½	.35	.47	.92½	1.11	.....	1.66½	2.47	2.73⅓	.....	.....	.....	.....	.....
Culvert	.....	.....	.....	.57	.67	.93	1.20	.....	.....	1.80	2.10	2.25	3.35	4.00	5.60	6.90	7.85
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Newark, N. J. (d)	.....	.....	.....	.....	.90	1.15	1.50	.....	.....	1.85	2.35	2.76	3.77	4.93	6.21	7.66	9.28
Unreinforced	.....	.16	.25	.37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Tacoma, Wash.	.14	.16	.22	.32	.45	.64	.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wahoo, Neb. (c)	.....	.....	.....	.....	.85½	.....	1.14	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31

(a) 24-in. lengths. (b) Sewer, 21-in., 1.48; culvert, 21-in., 1.45. †21-in. diam. (c) Reinforced, 15.40 per ton, f.o.b. plant. (d) Reinforced; 21-in., 1.69; unreinforced, 21-in., 1.26; 5% cash discount.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Miniature Golf and the Cement Industry

Demand for Cement Foundations, Chutes, Guard Rails and Holes Has Begun

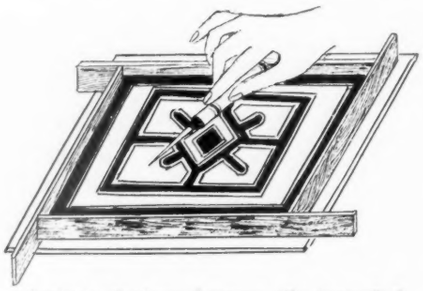
By George Rice
Palo Alto, Calif.

MINIATURE GOLF COURSES, which are being constructed on vacant lots in the cities and towns of the United States, are having an effect upon the cement industry in a way which was not contemplated when the games were first started. In the beginning not much money was invested by the promoters of a golf course, and as soon as the grass disappeared under the tread of many feet and the forcible blows of the drivers, a dust was set up that caused complaints from the neighbors. Green grass-colored matting was laid down on some of the courses, but the dust worked through the meshes and the first shower made mud. Burlap, dyed green, to resemble grass, was also tried, but this wrinkled and went to pieces in a few days' heavy playing. Green colored sawdust and shavings blew away or soon became useless because of the earthy matter mixing in. Even second-hand rugs and carpets were bought up and used as flooring to walk on and the balls to roll on. But they did not last long.

Then concrete foundations and various forms of flagging and tiles were laid down where the heaviest playing takes place and green colored rubber, felt, cotton and other kinds of mats were spread on top. Soon it was discovered that the bare, smooth surface of the cement gave the best satisfaction and in many instances the mats were moved aside, and the play continued on the plain cement.

Accessories in Cement Follow the Underfoot Tile Idea

The success of the cement underfooting induced many of the proprietors of these

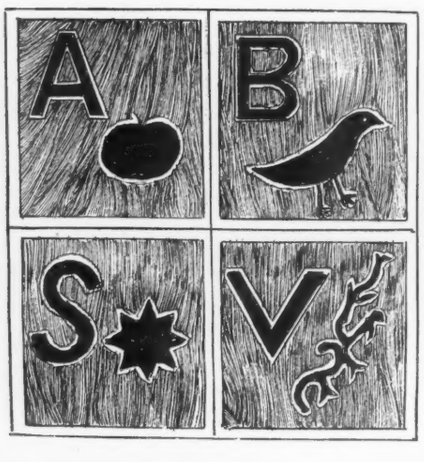


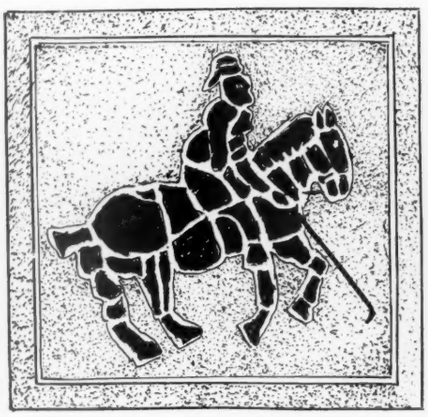
Artistic designs feature tile intended for practice areas

golf courses to place contracts with concrete engineering firms to replace many of the wood and metal accessory devices with similar apparatus constructed of cement or concrete. Weak bridge walls and edgings which were made up of clay, or some material lacking the resisting properties to hold itself intact when accidentally trod upon or hard hit with a stick, were replaced with substantial structures.

In some of the play fields which we visited we noticed that the tunnels and chutes and various forms of handicaps through which the players drive the balls were made of sheet metal. In one place where crowds of people were engaged in the games, ordinary stove pipes were laid for this purpose. These were dented where stepped upon or hit and the green enamel was scaled off, thus giving the entire grounds a shabby appearance, although all other parts of the grounds were beautiful to see. When this type of equipment for miniature golf is constructed of concrete, and the concrete colored the much wanted grass green, it will stand up against any form of strenuous playing by the participants. It will not cave in or crack or otherwise become distorted if trod upon or hit with a ball or a stick.

There are miniature water pools arranged about over which the players are supposed to drive the balls without losing them in the water. I saw some of these pools made of





Ornamental tiles and plaques being used for flooring in miniature golf courses

wood and was told that they leaked and had to be refilled often. Some are made of sheet metal, but these will not last long, as they, too, will leak when rust, mould and other bacterial action begins, because the under part of the metal rests upon the earth into which it is sunk, with the rim of the tank about level with the ground.

Average Miniature Golf Course Builder Not a Concrete Expert

I examined a number of miniature hills, slopes, water basins, foundations, plaques, tunnels, bridge walls and other golf course equipment which enterprising attendants had endeavored to construct using cement, which proves that these men who work at the business constantly realize the need of more substantial fittings than can be obtained with clay or wood or tin. But the average man is not an expert at mixing cement with sand and gravel for the purpose of obtaining a stable concrete. I saw them mixing magnesite with portland cement in one lot which was in process of being changed into a golf course. Even when they know something about a concrete mixture, they are likely to get it too rich, using 1 part cement to equal parts of sand and gravel. Or they may get the mixture too lean for the service it has to be put by using too much sand and gravel. Usually a standard mixture of 1 part cement, 2 parts sand and 3 parts gravel is the best for the arches, walks and walls of miniature golf courses. The wall work is not high, ordinarily consisting of walls just high enough to keep the balls from rolling off from a point where a protection of this kind is needed.

Color Is Not Very Well Understood

The management of a golf course who places his order with a concrete firm to do the work necessary to make his plot a model one need not worry about shapes and designs, nor the colors or the lasting qualities of the objects. But I find that some managers prefer to send one of their attendants out to buy 100 bags of cement and make a home job of it. The resulting work will not be creditable to the grounds. At another place which we made an inspection of, they had hand-painted all cement surfaces green, instead of mixing the color with the cement. The paint had already washed off from spots. In another place an amateur cement craftsman had obtained his color by mixing a vegetable color with the cement instead of using a mineral pigment, because he did not know that the acid and vegetable colors would be affected by the lime in the cement.

But we did see some first class concrete work in many grounds. There were ornamental tiles and plaques in some places which had been made by experts, a few of which we sketched and show herewith. Sometimes these are used as tiles to form a foundation to play on, in which case they are reinforced strongly. In the kindergarten section of one of these golf courses the flagging was constructed with inserts of letters and corresponding objects, such as A for apple, B for bird, S for star, V for vine and so on, so that the children while playing would be learning. Artistic designs on tile are produced when the tile is intended for the flooring of areas on which the adults play. All of which is developing a demand for cement which was not contemplated a few seasons ago.

An American Sphinx

A RESIDENT of Blue Point, N. Y., has decorated his front yard with a sphinx which he himself has constructed. The idea of making such an image was suggested to him, he says, when he was removing a large quantity of sand from his lawn. Instead of carting it away, he collected it into a large heap, and then drew up plans for his sphinx.

The sphinx weighs 42 tons

The sand was mixed with concrete and iron scrap.

The head of the sphinx is solid and weighs ten tons, while the entire image is calculated to weigh forty-two tons. The lower part has a circular chamber with an opening at the rear. Seats and pillars of concrete extend around its inner walls.

News of Iowa Manufacturers

H. E. KILMER of the Iowa Concrete Crib and Block Co., Des Moines, exhibited at the State Fair this year and reports many good prospects for cribs and silos obtained. Mr. Kilmer has had one of his best years in crib sales since he began business.

O. B. Lofstedt of the Modern Construction Co., Grand Junction, has installed equipment for making reinforced concrete culvert pipe and 36-in. drain tile. Over 2000 ft. of reinforced culvert pipe have been sold for county roads since the new equipment was installed.

Chas. Barnes of the B. J. Products Co., Red Oak, recently obtained a contract for a large water reservoir to be built in that city.

Chas. Wetzstein of Lake View Concrete Tile Co. reports better sales this year than for several years. Culvert pipe and drain tile are selling very well and several good block sales for farm buildings have been obtained. An exhibit at the Sac county fair brought in numerous prospects for future products sales.

The Iowa Concrete Products Co. has established a plant in Des Moines to manufacture culvert pipe and tile. Production will start at once on road pipe and an aggressive sales campaign has begun.

Frank Wilson of the Wilson Concrete Co., Red Oak, was awarded a $25,000 contract for sewer work in Red Oak last month. The project will require about 8000 ft. of concrete pipe from 12 to 42 in. in size.

The R. M. C. Vault Co. of Albia has been organized for the manufacture of burial vaults. The vault featured will be the automatic vacuum seal.—Iowa Concrete Products Association's *Concrete Products News.*

Consistent Advertising Wins

TOO MANY concrete products manufacturers depend on momentum to keep their businesses profitable all the year around, according to R. L. Gavin, secretary-treasurer of the Iowa Concrete Products Association with headquarters in Des Moines. In the last issue of the association's monthly bulletin, he says:

"When business is none too good, some manufacturers advertise a little. When it picks up as a result of this advertising they cut it out to save money, but they lose the momentum they have gained. Then they start all over again. But somehow, they never seem to get anywhere.

"Others start in with a consistent campaign. When business begins to come in as a result of this advertising, they keep on, using the momentum which their sales have produced, to gain more. And from year to year they go on and on to new peaks of volume and profit.

"How are you advertising? Don't you think that right now is a good time to analyze your sales, merchandising and advertising program, and put it on a basis where more consistent returns are assured?"

Crushed Stone Producer Finds Market in Miniature Golf

A NUMBER of the new miniature golf courses in the county have been supplied with crushed stone from Huber's quarry at Belfry, Penn., according to the *Norristown* (Penn.) *Herald,* because it will last years and give good service in other ways. Crushed stone distributed right makes an ideal walking surface at the miniature golf grounds.

Connecticut Ready-Mix Plant Opens with Ceremony

SEVERAL HUNDRED GUESTS including practically all of the building contractors in these parts assisted recently at the formal opening of the new plant of the Bridgeport Concrete Co., on land adjoining the City Ice & Coal Co., in Seaview Avenue, Bridgeport, Conn.

John G. Schwarz, president of the company, acted as chairman of the reception committee and he was ably assisted by Harry E. Husted, Homer Godfrey, Richard H. Murphy, Thomas De Forest, Howard Clark, Benjamin Plotkin, R. J. Hannan and Webster Walker.

A handsome new silk American flag was unfurled to the breeze by Mr. Schwarz who announced that the pole was the gift of the City Ice & Coal Co., and the flag of Mr. Plotkin. "Long may it wave," said Mr. Schwarz as the band struck up the Star Spangled Banner.

Then followed an inspection of the massive new plant showing the process by which the concrete is mixed and made available for instant use. Preceding the inspection of the plant several of the company's new trucks headed by music paraded the streets of the city and aroused much favorable comment.

The companies comprising the Bridgeport Concrete Co. include the City Ice & Coal Co., City Lumber Co., Fairfield Masons' Supply Co., Hannan Lumber & Supply Co., H. C. Godfrey Co., Frank Miller Lumber Co., Iron Ledge Co., Pierce Mfg. Co. and the Schwarz Bros. Co.—*Bridgeport* (Conn.) *Times-Star.*

Progress Reported on Tulsa, Okla., Cement Project

SATISFACTORY PROGRESS is being made by the Missouri Portland Cement Co. in closing deals for the purchase of acreage necessary for a plant site south of Dawson, A. H. Burgess, realtor who has handled the transactions for the company said recently to a representative of the *Tulsa* (Okla.) *Tribune.*

To date, the company has a $25,000 investment in plant and quarry acreage, and the amount probably will be increased to $50,000 as the final details of sale are completed for land on which the company now holds options. Examination of abstracts is now in progress.

Fifty-three acres are being purchased at the plant site, 30 of which it is estimated will be required for the plant proper, the remainder to be used as the source of shale supply for manufacture of the cement. A tract of 445 acres has already been purchased east of Garnett on the Frisco railroad, just over in Rogers county, for the limestone quarry.

The plant acreage is being bought from the Industrial Corp., a company formed by a number of Tulsans, including W. G. Skelly, Fred W. Insull, J. H. Leavell, Cyrus S. Avery, C. A. Mayo and others, to block up industrial acreage for sale at reasonable prices to industries. The first actual purchase by the Missouri Portland company was made shortly after the announcement was made in June that a cement plant would be installed here, the original payment amounting to approximately $16,000.

Two officials of the company visited Tulsa recently on business in connection with the project. They are P. H. Blaise, general superintendent over all plants, and an engineer named Stephens.

Geoff. A. Seager, chemical engineer, it was said, will begin the work of taking out samples of limestone and shale at the two sites to be shipped to Kansas City for chemical tests at one of the company's plants there. These will govern the exact type of machinery and equipment to be used in the Tulsa plant, it was said.

Hiram Norcross, vice-president, is now in Europe studying modern methods of cement manufacture evolved there, with the thought of incorporating any acceptable ideas in the Missouri Portland plant now undergoing remodeling at Kansas City, and also in the one proposed for Tulsa.

It is not anticipated that excavating for the Tulsa plant will get under way before January 1, and it is predicted nine months will be required for completion.

Plan Slate Mining in Georgia

ORGANIZATION of a company to finance extensive slate mining operations in north Georgia was indicated by W. W. Jones, president of the Augusta Roofing & Metal works, who has just returned from a two months' prospecting trip in the Fairmont, Georgia region, Gordon county.

Mr. Jones, who is familiar with slate in quality, as well as mining, said he recently discovered large slate deposits in this section, and deciding that it could be mined profitably, spent two months in prospecting the vein, with the result that he has become extremely enthusiastic over the possibility of mining slate in Georgia for commercial purposes.

"Practically all slate used for roofing purposes now comes from Vermont," Mr. Jones stated, "and the possibilities of utilizing such deposits in Georgia have never before been considered seriously."

Mr. Jones said he has carried forward extensive prospective operations, with the result that he has struck a rich vein of green slate, of even finer quality than the average Vermont product, and in such volume as to make intensive mining profitable, he said. He has already secured options on all the favorable property in that section, he said, and expects to begin immediately the organization of a company to finance the development of the new industry.—*Augusta* (Ga.) *Chronicle.*

Mississippi Portland Cement Co. Chartered—Novel Methods Proposed

THE LOCAL NEWSPAPERS in Mississippi have been filled during the past two weeks with stories of the project to build a portland cement mill in that state. The following from the *Philadelphia* (Miss.) *Democrat* gives the most complete information:

"A charter has been granted the Mississippi Portland Cement Co., a corporation with a capital of two and one-half million dollars ($2,500,000.00) according to a statement released by W. S. Guest a member of this company with offices in Philadelphia.

"Options have been obtained in and around Macon, Brandon and West Point, Miss., by the cement company, these points showing better cement properties than other places in the state.

"The capacity of this plant will be 6000 bbl. or 1600 tons per day. According to plans and specifications, one train load of cement per day will be shipped from the point. Surveys show that Mississippi has an unlimited amount of lime of the very best grade used for this purpose. The intention of the company is to manufacture raw materials into clinker form, and establish four grinding and packing plants in different localities over the state. The clinker will be shipped from the main plant to these different finishing plants, the finished product being distributed from these.

"Mr. Alford, one of the charter members of the company, has purchased 75,000 shares of the company's capital stock, and expects to get co-operation from the people in the locality, where the plant is located.

"Mr. Alford built and operated the Signal Mountain cement plant at Chattanooga, Tenn., which produces 6,000 bbl. per day, this plant having in the past few months made a phenomenal success. He also rebuilt the Warrior plant at Demopolis, Ala., and operated it. This same man will supervise building of the Mississippi plant and will be active in its operation.

"It is thought now, that in sixty days, the plant will be under construction."

The address of W. S. Guest is given as Phoenix building, Birmingham, Ala., and of B. R. Alford, consulting engineer, Canal Bank building, New Orleans, La.

Canadian Gypsum Tests

TESTS MADE BY the Canadian Department of Mines on 61 crude and 4 calcined gypsums from Nova Scotia, New Brunswick, Ontario, Manitoba and British Columbia show that Canadian gypsums are suitable for the manufacture of all structural materials having a gypsum base and that many have the high degree of purity necessary for dental plaster, terra alba, pottery plaster and fine finishing plasters.

Prepare for Sand and Gravel Convention Exhibit

Manufacturers' Division Meeting, National Sand and Gravel Association, Held in Chicago, September 19

AT THE ANNUAL MEETING of the Manufacturers' Division of the National Sand and Gravel Association at the Stevens Hotel in Chicago on September 19, M. B. Garber of the Thew Shovel Co. was unanimously re-elected chairman.

The following vice-chairmen were elected: C. H. Adamson, Stephens-Adamson Manufacturing Co., Aurora, Ill.; H. M. Davison, Harnischfeger Sales Corp., Milwaukee, Wis.; D. D. Guilfoil, Sauerman Bros., Inc., Chicago, Ill.; W. H. Potter, Manganese Steel Forge Co., Philadelphia, Penn.; L. W. Shugg, General Electric Co., Schenectady, N. Y.; Bruce G. Shotten, Hendrick Manufacturing Co., Carbondale, Penn.

The meeting on September 19 was preceded by a session of the executive committee on the preceding afternoon and by a dinner on the preceding evening, at which John E. Sankey, president of the Illinois Sand and Gravel Association and president of the Joliet Gravel Co. of Springfield, Ill.; T. E. McGrath, vice-president of the McGrath Sand and Gravel Co., Lincoln, Ill.; George W. Renwick, vice-president and general manager of the Chicago Gravel Co., Chicago, Ill.; Otto J. Ellingen, vice-president and general sales manager of H. D. Conkey and Co., Mendota, Ill., and Frank A. Bingham, manager of the Northern Gravel Co., West Bend, Wis., were guests.

T. E. McGrath, as principal after-dinner speaker, reviewed the condition of the sand and gravel industry in Illinois, stating that the capacity of the existing plants was far beyond present consumption and far beyond need or possibilities of demand, and urged the members of the manufacturers' division of the association to co-operate with the established industry in the state to discourage new enterprises unless a really adequate market survey justified them.

He assured the members of the manufacturers' division that it was as much against their best interests to encourage new enterprises at the expense of their old customers as it was to the disadvantage of the established sand and gravel industry and some, at least, of the manufacturers present openly agreed with him.

The other producers present were introduced and spoke briefly.

Plans for Convention Exhibit

The principal business of the meeting was to discuss arrangements for the annual convention to be held in St. Louis, Mo., January 27, 28 and 29, 1931. The plans for booth space and for taking care of the convention were fully explained by Chairman M. B. Garber and Secretary V. P. Ahearn, and entire satisfaction was expressed by the manufacturer members.

The arrangements for the 1931 convention are exceptional in that for the first time the conventions of the National Road Builders' Association, the National Sand and Gravel Association and the National Crushed Stone Association come consecutively in the order named. The National Sand and Gravel and the National Crushed Stone associations' conventions will both be held in the Jefferson Hotel and the same layout for exhibit space will hold through the conventions, and through all possible co-operation between the two associations, full advantage of the economy of this arrangement will be taken. There will be one charge for the drayage, packing and unpacking of the exhibits, and where possible and the exhibitors desire it, the same space may be obtained to hold for the two successive conventions. There will be a gap of four days between the Sand and Gravel convention and the Crushed Stone convention, but through arrangements by the two associations with the hotel authorities, it will not be necessary to take down or remove the exhibits in this interim.

Round-Trip Railway Fares

Another advantage of having the three conventions in successive weeks, which has never been accomplished heretofore, and which will be particularly appreciated by the exhibitors who will have to attend all three or two of the conventions, is that through the co-operation of the three associations, the railroads have granted round-trip tickets with a 30-day time limit at the regular fare and-one-half rate, so that convention certificates obtained from any one of the three associations will be good for return at any time after one or all three of the conventions.

It was also brought out, of course, that if exhibitors or others wish to return home between conventions, they can make each round trip at the regular convention rate. The saving from this arrangement with the railroads in the aggregate will undoubtedly mean a saving of several thousand dollars to the convention delegates.

Finances Discussed

A very frank and comprehensive discussion took place regarding the desirability of increasing the annual dues for membership in the Manufacturers' Division, and also the possibility or desirability of increasing the booth rentals at the exhibit in order to provide the national association with more funds, the directors of the association having previously discussed this subject with the chairman of the division.

The general consensus of opinion of practically everyone present was that this year was a particularly inopportune time for increasing the dues of the association, but by a unanimous vote of the meeting, the desire was expressed to co-operate with the national association at some future time in helping further to increase the revenues of the national association. This may be done in any one of three of the following ways: (1) By increasing the membership in the Manufacturers' Division to approximately 100 members; (2) by increasing the annual dues of the members of the Manufacturers' Division, which are now lower than dues the same manufacturers pay in any similar organization; (3) by increasing the booth rentals, which are now on a very moderate scale as compared with the cost of exhibiting at similar conventions.

It was also voted at the meeting that in view of the fact that the national association would utilize the extra funds to equip the booths with furniture, which at previous conventions has been extra, and would also take care of the cost of an entertainment to be furnished by the Manufacturers' Division to the sand and gravel operators, the booth rental for the St. Louis exhibit would be increased from $50, which has been the booth rental price, to $75.

Exhibitors and Superintendents to Meet Together

Frank A. Bingham, manager of the Northern Gravel Co., West Bend, Wis., was present at the sessions of the manufacturers on both days to confer on his plans for a joint session of the superintendents and managers of gravel plants and the manufacturers of equipment. Mr. Bingham is the chairman of the association's committee in charge of this part of the program, and J. R. Thoenen, mining engineer, United States Bureau of Mines, is also a member of the committee, and has made a very practical and helpful contribution to it by obtaining for the Bureau of Mines very comprehensive reports by various gravel operators

on the character and costs of their operations. These papers are to be published by the Bureau of Mines in the form of monographs, and two or three at least will be available in time for the January convention of the industry. These papers will be taken up and discussed at the operators' meeting and unquestionably will prove the basis of an extremely interesting and valuable exchange of information.

All present were very much enthused over the possibilities of the coming convention, notwithstanding the so-called business depression of the present moment.

Registration

The list of those registered at the general meeting on September 19 follows:

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.:
Abe Goldberg.
American Manganese Steel Co., Chicago Heights, Ill.:
Perry Magbe.
Bucyrus-Erie Co., South Milwaukee, Wis.:
F. O. Wyse.
Climax Engineering Co., Chicago, Ill.:
F. E. Blanchard.
Deister Machine Co., Fort Wayne, Ind.:
Irwin F. Deister.
Good Roads Machinery Co., Kennett Square, Penn.:
M. A. King.
Harnischfeger Sales Corp., Milwaukee, Wis.:
H. M. Davison.
Hendrick Manufacturing Co., Carbondale, Penn.:
Bruce G. Shotton.
Jaeger Machine Co., Columbus, Ohio:
H. L. Bachman.
A. Leschen and Sons Rope Co., St. Louis, Mo.:
V. C. Browne.
Link-Belt Co., Chicago, Ill.:
A. K. Schifflin.
Manganese Steel Forge Co., Philadelphia, Penn.:
W. H. Potter.
Manitowoc Shipbuilding Co., Manitowoc, Wis.:
T. J. Ryan.
Morris Machine Works, Baldwinsville, N. Y.:
F. S. Salchenberger.
Nordberg Manufacturing Co., Milwaukee, Wis.:
Delbert Kay.
Northern Gravel Co., West Bend, Wis.:
Frank A. Bingham.
Ohio Power Shovel Co., Lima, Ohio:
Grant Davis.
Pit and Quarry, Chicago, Ill.
S. A. Phillips.
Robins Conveying Belt Co., Chicago, Ill.:
M. S. Lambert.
ROCK PRODUCTS, Chicago, Ill.:
Nathan C. Rockwood, R. C. Sullivan.
Sauerman Bros., Inc., Chicago, Ill.:
D. D. Guilfoil.
Smith Engineering Works, Milwaukee, Wis.:
Victor H. Jones.
Stephens-Adamson Manufacturing Co., Aurora, Ill.:
C. H. Adamson.
Thew Shovel Co., Lorain, Ohio:
M. B. Garber.
Transit Mixers, Chicago, Ill.:
R. M. McMung.
United States Bureau of Mines, Washington, D. C.:
J. R. Thoenen.

New England Crushed Stone Association

THE REGULAR MONTHLY MEETING of the New England Crushed Stone Association was held at the Parker House, Boston, Mass., Friday, September 19. Starting with the customary luncheon, which was served at 1 p. m., which consisted of a delicious lobster and fixings, the meeting soon after got down to the business to be discussed.

This association is of recent formation, having had the first meeting in April of this year.

The meeting was called to order by B. A. McKinney, president, and after H. R. Brownson, secretary, read the minutes of the previous meeting, the meeting was opened to suggestions and discussions mutually benefiting to all.

The meeting was well attended, and the following gentlemen representing their respective companies were present: B. A. McKinney, West Roxbury Trap Rock Co.; H. R. Brownson, Rowe Contracting Co.; Otho M. Graves and Thomas Lanigan, General Crushed Stone Co.; Arthur S. Lane, John S. Lane & Sons Co., Inc.; T. C. Cooke, Lynn Sand & Stone Co.; William E. Hilliard, New Haven Trap Rock Corp.; A. L. Worthen, Connecticut Quarries Co.; W. S. Railsbach, Lawrence Crushed Stone Co.; Mr. Robinson, Massachusetts Broken Stone Co.; Mr. Norton, Hollison Trap Rock Co.; Mr. Caputo, Saugus Sand & Stone Co.; Fred S. Peters, ROCK PRODUCTS.

The meeting adjourned about 5 o'clock, after it had decided to hold the next meeting Friday, October 17, place to be announced later.

Samuel L. Kirkpatrick Killed by Automobile in Front of His Stone Plant

SAMUEL L. KIRKPATRICK, age 69 years, president of the Orange Quarry Co., Eagle Rock Ave., West Orange, N. J.; also of the Lambertville Stone Quarry Co., Lambertville N. J., had been discussing rebuilding of the Lambertville plant with several associates, and started to cross the road to the plant, when a truck came from the direction of the plant and another car, driven at a high rate of speed by Mrs. Ada M. Reading, of Stockton, swerved to avoid hitting the truck, and struck Mr. Kirkpatrick, causing injuries which resulted in his death.

The accident occurred Thursday afternoon, September 18. Mr. Kirkpatrick died in the St. Francis hospital, Trenton, N. J., on Saturday afternoon, September 20. Surviving him are his widow, Mrs. Minnie Winans Kirkpatrick, a son, Louis W. Kirkpatrick, who has been associated with his father in the management of the companies, and two daughters, Misses Marion and Florence Kirkpatrick.

Mr. Kirkpatrick's residence was located in East Orange, N. J. He had a wide circle of friends and was well liked in the rock products industries. He began in the crushed stone business in New York state at the age of 15 years, and has been active in the industry for over 54 years. He opened the Orange Quarry 25 years ago; took over the Lambertville Stone Quarry Co. in 1927, and started to rebuild it in 1929. He was a member of the National Crushed Stone Association, and a pioneer in any new quarry development. He was said to be the first to try out well drills and one of the first to use jackhammers, drifters, etc.

Harold M. Scott Elected President of Keystone Portland Cement

UNDER DATE of September 8 the directors of the Keystone Portland Cement Co., Fidelity-Philadelphia Trust building, Philadelphia, Penn., announced the election of Harold M. Scott as president.

Their selection of Mr. Scott, following the death of John Barnes, former president, and one of its principal stockholders, indicates a policy of aggressive operation for the future has been determined upon by the company.

Although Mr. Scott may be looked upon as one of the younger men of the industry, he has had some 25 years' experience, having formerly been connected with the Lehigh, Edison and the Atlas Portland Cement companies. He was general sales manager of the Atlas Portland Cement Co., which was acquired in January of this year by the Universal Portland Cement Co., subsidiary of the United States Steel Corp.

Construction of the two additional kilns, grinding equipment and storage facilities, which were inaugurated about a year ago at the Bath, Penn., works of the Keystone Portland Cement Co., have been practically completed, which makes this plant one of the largest single units in the eastern territory.

Wilson P. Foss

WILSON P. FOSS, of New York City and Nyack, N. Y., chairman of the board of the New York Trap Rock Corp., who, incidentally, was American amateur billiard champion from 1901 to 1904, died September 21 of heart disease at his city residence, 155 East Seventy-second St., in his seventy-fifth year. He left his wife, Anna de Baun Foss, and six children, Miss Ruth Foss, Mrs. Arthur Hiltebrandt, Mrs. A. D. L. Jewett, Wilson P. Foss Jr., Mrs. B. Corey Kilvert, wife of the artist, and Mrs. F. J. McFadden.

A native of Fairfield, Me., Mr. Foss was a manufacturer of hats in South Norwalk, Conn., before he went to Haverstraw, N. Y., in 1881 to make dynamite for the West Shore railroad during its construction. He represented the du Ponts in Mexico in 1883. For another ten years he manufactured dynamite but thereafter devoted himself to various stone-crushing operations on the west bank of the Hudson and became a director of several important corporations in that field. He was mayor of Haverstraw from 1896 to 1903.

In 1914 Jacob Conklin, owner of several quarries along the Palisades, left the bulk of his fortune of several million dollars to Mr. Foss, whom he had greatly admired personally and for his billiard prowess. Ten years afterward Mr. Conklin's widow precipitated the largest will contest ever filed in Rockland county when she bequeathed half of her $2,000,000 estate to Mr. Foss.—*New York* (N. Y.) *Times.*

Gypsum Products Specifications Revised

ANNOUNCEMENT is made by the American Society for Testing Materials of the formal adoption of new specifications and revisions of existing standard specifications for various gypsum products and methods of testing thereof. These include changes in the method of determining the consistency of calcined gypsum. Series of tests were conducted, using various instruments, and the Modified Vicat Apparatus was found to be the most desirable from the standpoint of accuracy and ease of manipulation. It has, therefore, been adopted as standard in place of the Southard Viscosimeter.

Other changes made in the standard methods of testing gypsum and gypsum products include substituting a 2-in. cube for the 2x4-in. cylinder when determining the compressive strength of calcined gypsum, neat and sanded. It was felt that a cube on account of its facility in molding, will give more accurate and uniform results.

So as to eliminate the possibility of dry-outs occurring in specimens used for determining the compressive and tensile strength, the standard methods of testing were changed so as to require the specimens to be retained in the molds in moist air until thoroughly hardened, but not less than twenty-four hours.

Since the adoption of the standard methods of testing gypsum and gypsum products, in 1927, the standard size of gypsum plaster board has been changed from 32x36 in. to 16x48 in. The standard size specimen for determining strength is 12x18 in. It is, therefore, impossible to obtain a sample for testing with the load applied parallel to the fiber in the surfacing. Inasmuch as these boards are applied with the fiber in the surfacing running at right angles to the supports the strength of the board with the load applied parallel to the grain in the paper is not so important. Until sufficient data have been obtained on the newer sized boards, which will permit a complete revision of the specifications for gypsum plaster board, a note was added to Section 26 of the standard methods of testing gypsum and gypsum products, omitting requirements for test strength with load applied parallel to the fiber of the surfacing.

Revision in Section 2—Grading—of standard specifications for gypsum plastering sand, was made after carefully considering the specifications which had been prepared by a joint committee composed of representatives of national organizations interested in the production and use of plaster materials. The revised specifications insure a better grade of plastering sand.

The tentative specifications for Keene's cement and for calcined gypsum for use in the preparation of dental plasters, with several slight changes, were adopted as standard.

There were a number of inconsistencies found in the sections on sampling and on packing and marking of the standard specifications for calcined gypsum, gypsum plasters, gypsum molding plaster and gypsum pottery plaster. These have been revised and the specifications adopted as standard.

Scrubber for Removing Clay Balls from Gravel

WILLIAM H. ALLSWEDE, president and general manager of the Hersey Gravel Co., Hersey, Mich., has perfected and applied for patents on a scrubber for removing clay balls and decayed stone from gravel which promises to exceed in capacity and efficiency all previous effort along this line. This problem is one which has been a constant annoyance and expense to all producers who have been so unfortunate as to find clay or cemented material in their deposits.

Mr. Allswede has studied and experimented with various methods for eliminating clay balls, over a long period of years. He has tested all the physical agents which would separate clay from gravel by gravity, flotation, centrifugal and other forces as well as various schemes for pulverizing it fine enough to be readily suspended in water.

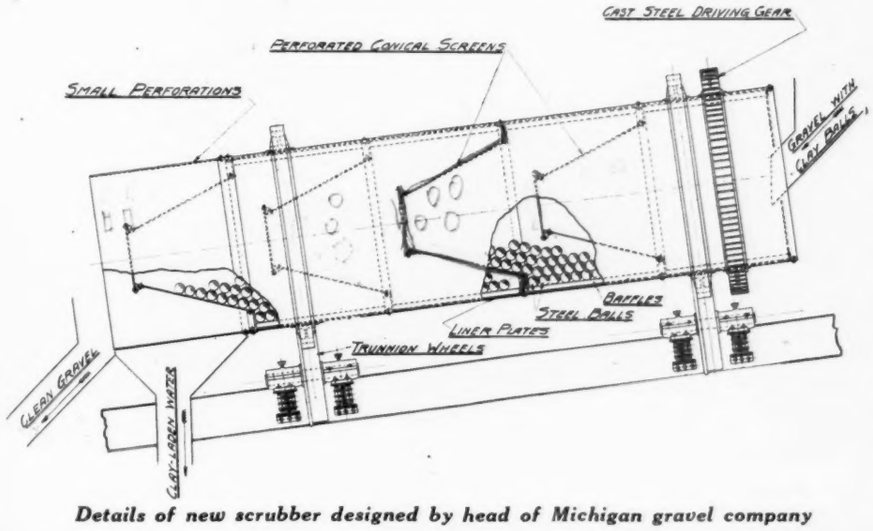
The "Allswede" Scrubber is cylindrical in form and revolves on trunnions similar to several types of scrubbers now on the market. It is divided into three or more compartments which successively grind the clay balls until they will completely dissolve in the water. The grinding agent consists of hardened steel balls, a limited number of which are installed in each compartment. Longitudinal baffles tend to stir and roll the gravel with the steel balls within the cylinder and only a small amount of water is necessary to take up the ground clay.

At the discharge end of each section a conical screen serves to permit the gravel to pass on to the next compartment, while retaining the steel balls. The steel balls used are about twice the diameter of the maximum size of gravel being washed.

The final section of the unit consists of a screen with small slotted perforations which serve to drain the dirt-laden water from the gravel while the latter discharges from the end of the cylinder.

Mr. Allswede is considerably gratified with the results obtained from his first scrubber of this type. It is designed for cleaning 1-in. down gravel, which it handles satisfactorily at the rate of about 50 tons per hour. This grade of material, which formerly had caused him no end of trouble, is now being accepted by the train loads without question. He is installing a larger unit designed to handle 100 tons per hour.

The Allswede Scrubber can be built of almost any diameter and length and with any number of compartments, according to the capacity required and the amount of clay or soft stone contained in the material. The manufacturiing and selling rights have been given to the Greenville Manufacturing Works of Greenville, Ohio.



Details of new scrubber designed by head of Michigan gravel company

Penn.-Dixie Sales Appointments

EFFECTIVE September 16, the Pennsylvania-Dixie Cement Corp. announced the following changes in personnel in its Boston, Mass., office:

H. E. Bernt was appointed district sales manager. He succeeds E. G. Brick, who has asked to be relieved of the responsibilities of that position. Mr. Brick, however, will remain with the corporation, his future duties giving him more frequent contact with the trade.

Mr. Bernt has for some time past acted as assistant district sales manager and he is therefore familiar with the territory and its requirements.

R. M. Penman, who has been connected with a leading cement manufacturer for the past 21 years in various sales capacities, has joined the Penn-Dixie organization and was appointed assistant district sales manager of the Boston office.

New Machinery and Equipment

Storage Battery Locomotive

THE ACCOMPANYING illustration shows a 50-ton storage battery locomotive manufactured by the Atlas Car and Manufacturing Co., Cleveland, Ohio.

It is fitted with air brakes, air whistles, air sanders, auxiliary hand brakes, headlights, bell, automatic railroad couplers and other accessory equipment. The weight is 100,000 lb., and the rated drawbar pull, 18,000 lb. at 5 miles per hour. The locomotive is operated by four 75-hp. motors, and control is of the contactor type with two control stations in the cab. The battery is a 200-cell MVA-41 Exide Ironclad.

Storage battery locomotive operated by four 75-hp. motors

The locomotive shown is in use by the Texas Power and Light Co., and both its motor and battery equipment are duplicates of a 25-ton locomotive which the same company has used for a number of years.

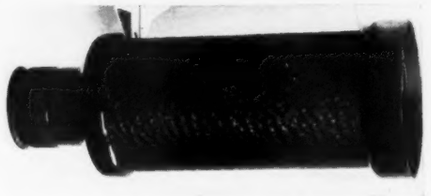
New Pocket Radiation Pyrometer

A NEW PORTABLE PYROMETER known as the K & S Pocket Radiation Pyrometer, recently brought out, should be useful to anyone interested in determining temperatures in rotary kilns and furnaces of any kind quickly and easily and at the same time accurately. This new instrument is easily portable, being 2 in. in diameter and 6 in. long, outside dimensions, and weighing only 6 oz. It is self-contained and gives direct readings on the scale without any other computations or comparisons, and may be used as easily as a telescope by anyone, without previous instruction.

It is a development of the "total radiation" type of pyrometer, being operated by the radiant energy given off by the heated object, and containing a small bi-metallic spiral at the focus of the collecting lens connected with a pointer in such a way that the radiated energy causes the pointer to rotate over a scale upon which the temperature is read. In addition to high sensitivity and accuracy, it is claimed that even on low temperatures the heat intensity is indicated within a few seconds. It is arranged with a compensation spiral so that the readings are not dependent upon previous measurements or the height of the surrounding temperature, and the scale may be turned to compensate for variations of room temperature.

The scale is transparent, so that the observer may see the glowing surface or object being measured at the same time he is reading the temperature on the scale. In this way by observing the readings while slowly moving the instrument the hottest point may easily be found. To protect the eye against too bright rays when measuring high temperatures a red glass is provided.

The instrument has a "distance factor" of about 12, meaning that the distance from the instrument to the furnace opening or the piece of material whose temperature is to be measured should not be more than 12 times the size of the furnace opening or piece of material. It has been used in the cement industry for about eight months and is claimed to have an accuracy within 10 to 20 deg. F. when checked with calibrated electrical pyrometers. It is available in five scale ranges: 1100-2600 deg. F., 1100-3000 deg. F., 1100-3300 deg. F., 1100-3700 deg. F. and 1100-4000 deg. F.



Pyrometer for determining temperatures in rotary kilns

The instrument is being introduced through Dr. R. E. Windecker, consulting chemist, 862 Union Trust building, Cleveland, Ohio.

New Rear Dump Wagon

THE EUCLID CRANE AND HOIST CO., Euclid, Ohio, has added to its line of "Track-Wheel," crawler-type wagons a new 6-yd. gravity rear-end-dump designed for quarry operators and road builders, the varied usefulness of which, it is claimed, has been proven far beyond expectations.

Specifications for the new dump wagon are as follows: Length overall, 14 ft. 10 in.; width overall, 10 ft. 1 in.; width, center to center of track, 8 ft. 5 in.; width of track, 1 ft. 3 in.; height of track, 2 ft. 10 in.;

Left—Showing the new 6-yd. gravity rear-end-dump wagon loaded with rock, and, right, showing the wagon in dumping position

length of track, 6 ft.; length of body inside, 9 ft.; width of body inside, 6 ft.; depth of body, 3 ft.; loading height of body, 6 ft. 10 in.; level measure capacity, 5⅔ yd.; crowned measure, 6½ yd.; weight, approximately 9000 lb.

The new dump wagon is operated from the driver's seat by the tractor operator who pulls the trip lever by a rope connection, dumping the load. When emptied it automatically falls back into loading position without human or mechanical assistance, eliminating the labor of the wagon dump man.

According to the description of the manufacturer, tractors as small as the "Caterpillar Thirty" have operated this 6-yd. wagon loaded with rock, sand or sticky clay up 5% grades in high speed day in and day out, over the roughest conditions. It is heavily reinforced at the bottom, drilled for protection planks and designed to eliminate the possibility of rocks or other material warping the sides at the rear of the body out of shape, being heavily reinforced at the outer edge by a strong steel casting.

Oxygen and Acetylene Manifolds

AS AN ECONOMICAL means of gas distribution for small users of oxygen and acetylene, the Oxweld Acetylene Co., New York City, has introduced the two small capacity manifolds shown here.

Where it is necessary to have a number of welding stations, and the consumption of

Fig. 1. Six-cylinder oxygen manifold

gases is not large enough to warrant the installation of an acetylene generator and large oxygen manifold, it is claimed that these small manifolds will prove an effective means of having a piped supply of gases.

The wall type 6-cylinder oxygen manifold shown in Fig. 1 has the duplex feature, the same as the larger Oxweld manifolds have, so that three cylinders may be changed while the bank of three on the other side is maintaining the supply of oxygen.

The 4-cylinder acetylene manifold shown in Fig. 2 is also of the wall type. Each cylinder lead has a valve in the header so

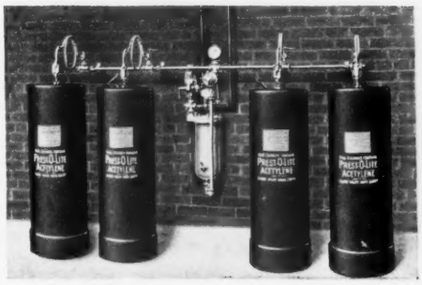


Fig. 2. Four-cylinder acetylene manifold

that each cylinder is independent of the others, making it possible to use either one, two, three or four cylinders at the same time. Thus a cylinder may be replaced without shutting off the acetylene supply. Each cylinder connection is fitted with a Prest-O-Lite flash arrestor, and the manifold is supplied with connections for Prest-O-Lite cylinders. This 4-cylinder acetylene manifold is designed for installations where piped acetylene is required, and where the installation of a generator would not be feasible.

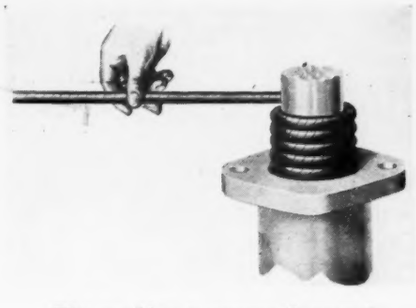
A New Packing

THE METALASTIC, INC., Union City, N. J., is now marketing a new packing called "Cordex" which, it is claimed, is radically different in form from other packings.

It is composed of metal particles, asbestos fiber, binder and a specially prepared lubricant encased in a thin shell of viscous material. It is not manufactured in coil form, but comes in straight rods, 18 in. in length. After the packing is wrapped around the rod, inserted in the stuffing box and the gland drawn up, the casing disrupts and a perfect seal and bearing are created.

It is maintained that this new packing possesses all of the well known advantages of the loose form of semi-metallic packing plus the additional advantage of easy insertion into the stuffing box; and that it will fit any stuffing box. The small sizes may be used for packing the larger boxes, and it is not necessary to have an exact size to pack a particular stuffing box.

According to the description, the new packing does not harden in the box, is always elastic and because of its anti-friction qualities furnishes a perfect bearing surface for rods and shafts.



The packing is wrapped around the rod

Tighter Seal for Blasting Machines

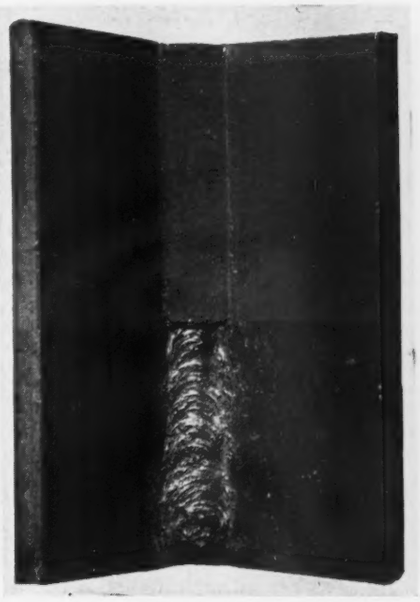
AN IMPROVEMENT on the Hercules "Ten Cap" blasting machine, which makes the machine more moisture and dustproof, is announced by the Hercules Powder Co., Wilmington, Del.

This machine is of the dynamo type and is pocket size. A special rubber gasket which seals case and cover has been developed as regular equipment and can be fitted to machines now in use.

Putty for Use on Welded Products

THE FUSION WELDING CORP., Chicago, Ill., announces a putty, marketed under the trade name of "Weldite fillet putty," for use in covering weld beads to give them a smooth finished appearance.

It is claimed that the appearance of welded products has kept many companies from using welding to full extent, as it is often difficult to evolve the same graceful lines



Illustrating how new putty is used to cover welded surfaces

which have been given to products employing castings. With the new putty, however, state the manufacturers, it is possible to benefit by the use of welding and still retain the appearance of castings.

The putty is applied to weld beads in any type of joints or position. It is furnished in a powder form to be mixed with water to any consistency, from paste for applying with some instrument such as a putty knife, to a consistency thin enough to be applied with a brush. A short time after being applied it becomes hard—as hard as iron, it is claimed—and it adheres tenaciously and will not loosen from shock or vibration.

Great Lakes Quarry Company Operates Broadcasting Station

OPERATION of radio broadcasting station WLC by the Michigan Limestone and Chemical Co. at Rogers City, Mich., is essential in order that the company keep in touch with vessels hauling its products on the great lakes, it was stated by John G. Munson, president of the company, before the counsel for the Federal Radio Commission, recently, the commission announced.

Following the hearing the following information was furnished to the commission:

Mr. Munson said that his company recently organized the Central Radio Telegram Co. to operate as a public service corporation to take over the point-to-point station WLC which his company has been operating at Rogers City, Mich.

He explained that an application for the voluntary assignment of WLC to the Central Radio Telegram Co. is now pending before the Commission. He also stated that the Michigan Limestone and Chemical Co. is a subsidiary of the United States Steel Corp. and that it has operated Station WLC since 1923 to communicate with the 1,000 or more vessels which operate on the great lakes hauling the products of the Michigan Limestone and Chemical Co., which operates a large stone quarry on Lake Huron.

He said that until recently his company has been handling 10,000,000 tons of limestone annually, and that due to the business depression the output this year will be about 85% of that amount.

"We feel that we are especially fortunate during this depression, as other concerns operating in our section report their output this year will be only from 70 to 75% normal," said Mr. Munson.

He explained that the Central Radio Telegram Co. has been organized under the state laws of Michigan with the approval of the Michigan Public Utilities Commission and it is capitalized at $50,000, but that only $12,500 worth of the stock has been sold, the remainder being in the treasury.

Counsel for the Commission indicated during the examination that they felt it is not necessary for this concern to be allocated eight frequencies, for which they applied, but that two or more would be sufficient.

Blast Does Damage at Wisconsin Quarry

AN OVERCHARGE of blasting explosive was blamed for an explosion recently at the Wisconsin Granite Co. quarry, Ableman, Wis., which tore up tracks of the Northwestern railroad, destroyed telephone wires, railroad signal wires, and cables of the Western Union Telegraph Co., and wrecked a building, two trucks, three electric transformers, and hundreds of dollars' worth of equipment of the Ableman Sandstone and Granite Co. Total damage is estimated at $15,000.

No one was injured by the explosion, which tossed huge rocks more than 1,000 ft. in all directions, blocking the railroad tracks and highway temporarily. Some of these boulders were so large they had to be removed from the tracks with dynamite.

Flying stones broke windows in several homes in Ableman, and the force of the explosion shook the ground for several miles.

No trains were delayed. Workmen rushed to the scene and replaced the broken rails immediately. A Madison-bound train passed the quarry a half hour before the blast, and no other trains were due until 7 p. m.—*Madison* (Wis.) *Times.*

Gordon F. Daggett to Represent Machinery Concern

GORDON F. DAGGETT, formerly executive secretary for the Wisconsin Mineral Aggregate Association, has joined the Stephens-Adamson Manufacturing Co., Aurora, Ill., and will handle this company's

Gordon F. Daggett

line of conveying, screening and transmission machinery for the entire state of Wisconsin. He will be located at 735 Briarwood place, Milwaukee.

Wide experience in designing and constructing screening and crushing plants, as well as conveyor equipment for industrial plants, has fitted Mr. Daggett for this new connection. His early training was gained in several power projects on the west coast, and he has spent the last 15 years in private practice, and in various positions on the Wisconsin Highway Commission at Madison. Later as executive secretary for the Wisconsin Mineral Aggregate Association he represented 48 plants producing sand, gravel and rock.

Would Use Mine Tailings for Agricultural Limestone

AN INTERESTED GROUP of farmers met with George Singer and County Agent E. Davis at the New Badger mine, Mineral Point, Wis., recently, to see what could be done towards saving some of the fine mine tailings for agricultural use. In the process now used at the mine there are about 30 tons of limestone a day that is crushed fine enough to pass through a 65-mesh screen.

The material is so fine that most of it floats off in the water and is deposited along the creek bank for several miles. It tests 77% calcium carbonate and is very suitable for agricultural use.

In order to save the material, Mr. Singer said, it would be necessary to build a settling pond and put in some kind of a dredge to haul the material out of the pond and into a pile where it would dry out. Mr. Singer stated that they would have to go to considerable expense to install the necessary equipment but that he would do it if the farmers were interested enough to take the material at a price not over 75 cents per ton. In view of the fact that common limestone costs about $2 per ton and is not ground so fine as the tailings, most of the farmers seemed to believe it was a good proposition, and stated they would help by buying and also to interest other farmers.

Mr. Singer was satisfied with the response and plans are being made for the saving of the material in the near future.—*Dubuque* (Ia.) *Telegraph-Herald.*

Rock Asphalt Co. to Make Factory Flooring

SINCE the organization of the Uvalde Rock Asphalt Co., San Antonio, Tex., in 1912, now one of the largest producers of limestone rock asphalt in the world, its products have been primarily used for surfacing of streets.

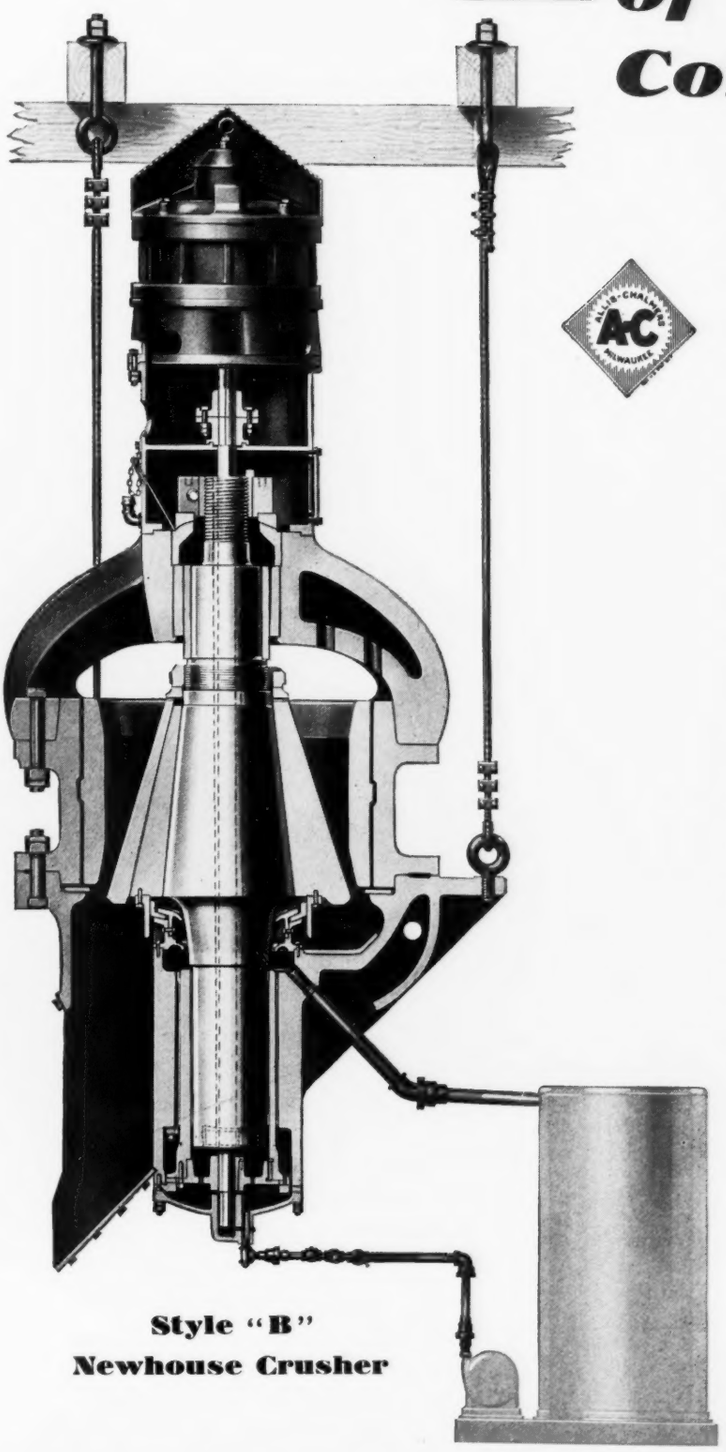
The company now manufactures "Duraco" for industrial uses. One of the crying needs in industrial plants has been for a durable, resilient paving material suitable for surfacing, resurfacing and patching floors, driveways, platforms and railroad crossings—a material that could be easily and economically applied without causing a loss of time in the use of the surface being treated. It is a scientifically prepared mixture of Uvalde rock asphalt, trap rock and flux oil.

Its resiliency is one of the qualities that makes Duraco a desirable material for industrial flooring. Used as a wearing surface over any type of rigid base, it absorbs shocks and reduces vibration by nearly 75%, it is claimed.

The officers of the Uvalde Rock Asphalt Co. are J. B. Smyth, president; G. H. Alvey, vice-president and general manager, and A. B. Alvey, treasurer.—*San Antonio* (Tex.) *Express.*

A Better Crusher

— of Simplified Construction



Style "B"
Newhouse Crusher

THE thought uppermost in the minds of crushing plant operators is in producing the maximum amount of finished product at the lowest cost.

The Style "B" Newhouse Crusher will do this. It is a high production machine. Due to its large unobstructed feed opening and its peculiar crushing action, it is easy to feed and will take large size material without bridging. Its short, rapid, crushing stroke gives it large unit capacity with a high percentage of the finished product of cubical shape and of uniform size.

The simplicity of the Newhouse Crusher makes it an economical machine to operate and to maintain. The absence of gears will be noted from the sectional view. There are few working parts and these are readily accessible.

The Newhouse Crusher is well suited to fit into present installations. It requires little head room. It may be suspended from the framework of a building by means of cables. The use of this crusher in new plants will simplify plant layout and reduce building costs.

The details of this *crusher that requires no foundations* are described in Bulletin 1469-A. Write for a copy. Or better still, let an Allis-Chalmers Engineer show you what this crusher can do.

ALLIS-CHALMERS MFG. CO.
MILWAUKEE, WIS.

ALLIS-CHALMERS

News of All the Industry

Incorporations

Mississippi Portland Cement Co., Jackson, Miss., $2,250,000.

Carolina Gravel Corp., Columbia, S. C. G. E. Walker, E. D. Walker and Z. C. Berry.

Carolina Marble Quarries, Inc., Andrews, N. C. To quarry marble.

Green River Lime Co., Whitewood, Ky. G. B. Taylor and C. T. Mullins.

Ready-Mix Concrete, Ltd., 660 St. Catherine St. W., Montreal, Que., Canada.

Young Cement, Coal and Lumber Co., Ltd., Ridgeway, Ont., Canada, $50,000.

Co-Operative Sandstone Corp., Bloomington, Ind. Ellsworth W. Deckard, Alger S. Burkhart and Jack O. Garrett.

W. F. Sell Construction and Material Co., Pana, Ill. Wm. F. Sell, Clifford Castle and Carl H. Preihs.

Houston Rock and Gravel Co., Houston, Tex., 100,000 shares, no par value. J. V. Fleming, W. P. Calloway and C. R. Weeks.

Joliet Stone Co., 901 Railroad St., Joliet, Ill., 750 shares, no par value. To produce and sell stone, gravel, etc. Frank A. Herman, Mamie and Kathleen Nusmyer.

The Cleveland Gypsum Co., Cleveland, Ohio, 250 shares, no par value. Robert W. Wheeler, S. D. Laitinen, I. R. Faist, M. B. and H. H. Johnson, Union Trust Bldg., Cleveland, Ohio.

Ohio Quartz Products Corp., Jackson, Ohio, 10,000 shares, no par value. To manufacture silica brick. Huxley and Smith, Mahoning Bank Bldg., Youngstown, Ohio.

Art Stone Construction Co., Ltd., Belleville, Ont., Canada. To manufacture and sell art stone and cast stone products, tile, brick, pipe, cement, concrete, and allied products.

The H. G. Meidell Tile Co., Madison, Wis., 150 shares at $100 per share. To manufacture and sell all kinds of tile, marble, terrazzo and clay products. H. G. Meidell, H. M. Meidell and Glenn W. Stephens.

Block Supply Co., Ltd., Toronto, Canada, 32,000 shares preferred, par value $1 each, and 33,000 shares common, no par value. To manufacture and deal in cement blocks, cement, concrete, limestone, sandstone, granite, shale, marl, lime, tiles, etc.

Quarries

Marengo Crushed Stone Co., Marengo, Ind., has filed papers evidencing final dissolution.

Darlington, Wis. The city quarry here is now in operation and is producing crushed stone.

Universal Granite Co., Morton, Minn., has purchased a tract of land, of approximately 36 acres, containing a large deposit of stone and located near Highway No. 14. It is expected that the company will soon begin quarrying operations here.

Carolina Marble Quarries, Andrews, N. C., incorporation notice of which appears in this issue, is to operate on a large scale a marble quarry located five miles west of Andrews, near Highway No. 10 and the Southern railway. The deposit is said to be of excellent color and quality.

Merritt, Chapman and Scott is to reopen the quarry at Frys Harbor on Santa Cruz Island, Calif. A crew of four men has been working the quarry for several weeks, but this number has now been increased to handle the order for 8000 tons of stone for the Procter and Gamble soap factory project at Long Beach.

Palmetto Quarries Co., Columbia, S. C., according to reports, has acquired a 68-acre tract of land containing a rock quarry at Lexington, S. C. It is also reported that the company has acquired the railroad right of way extending from the Southern railway line to the property.

The Deep Water Coal and Iron Corp., a $10,000,000 company, with valuable properties in Walker county, Ala., and the parent company for the Alabama Rock Asphalt Co., Birmingham, Ala., as well as a number of other coal and building material firms in this state, is reported to be in the hands of an ancillary receiver.

Hawkeye, Iowa. A serious shortage of water supply is causing the Hawkeye quarry to restrict its operations. The shortage has necessitated the shipping of water to the plant from Des Moines in tank cars employed for the purpose, but not enough water can be supplied by this method to keep all the machinery running at normal capacity.

Sand and Gravel

The Millville Gravel Co., Millville, Ohio, is supplying the gravel for the construction of Reily road from its plant on Indian Creek. Silas Shaw is chief engineer of the plant.

Porterville, Calif. A sand and gravel plant is being constructed here near the Santa Fe bridge on the Tule River by Frank O. Sheldon and Orville C. Jeffers of Porterville.

The Peter Milliron Sand and Gravel Co. has erected a $20,000 plant for handling sand, gravel, brick, cement and other builders' supplies at East Liverpool, Ohio. The operation includes docks for the mooring of river barges, a gasoline-operated crane, railroad switch and other facilities.

Central Bridge and Construction Co., Wahoo, Neb., is operating a new gravel pit on land leased from A. J. Ladenburger at Morse Bluff, Neb. Gravel from the pit is being used to surface the road between Morse Bluff and Cedar Bluffs, Neb.

Burlington, Wis. A warehouse, 60 x 70 ft., is to be constructed at the county gravel pit near this city by the county highway committee. The building will be used as a storehouse for housing county machinery used in the west end of the county, and also as a repair shop. The estimated cost of the structure is $4,500.

Riverside Sand, Gravel and Crushed Stone Co., Amarillo, Tex., is planning the erection of a new plant with a capacity of about 35 cars of crushed stone daily. Equipment will include elevating, conveying, crushing and other machinery, as well as a 50-ton industrial locomotive. W. L. Slayden is head of the company.

George T. McLean Co., Portsmouth, Va., is opening a second building materials distribution plant at Portsmouth. The old plant of the Portsmouth Contractors Building Supply Corp., located on the Belt Line Railroad and Western Branch Road between High and Glasgow Sts., has been taken over by the McLean company. The entire plant has been modernized, the sand and gravel elevator placed in condition, and the latest type scales installed.

Fontana, Wis. State Highway Geologist Doerr of Madison, Wis., and two assistants made an inspection of four gravel pits here recently, in preparation for the work on highway 36 which will get under way next year. The information obtained will be used by the construction companies and road engineers when paving of the highway is started. The geologists' report includes the largest stone to be found, the average pebble count and percentage of silt, loam, quartz, sand and limestone of various deposits.

Spring Valley, Ill. A proposition was recently made to the Spring Valley council to lease the city gravel pit located just off the C. B. & Q. viaduct. F. W. Nelson of Grand Rapids, Mich., representing a Peru, Ill., company, addressed the council stating that he has an option on the adjoining property for establishing a sand, gravel and crushed rock plant and wanted the city property which is located on the railway, as an outlet for his product. He offered to lease the city gravel pit for a term of eleven years at a rental of $100 a year, and also agreed to furnish the city free 3000 cu. yd. of gravel or crushed rock for road work.

Lime

National Gypsum Co., Luckey, Ohio. Burglars entered one of the buildings of the company's lime plant and stole 1000 dynamite caps.

Cement

Lehigh Portland Cement Co.'s plant at Fordwick, Va., is to resume full-time operation on or about October 1. The plant has been running on half time for more than a year.

Crescent Portland Cement Co. resumed operations at its Wampum, Penn., plant on September 15, according to Superintendent W. P. Price. The plant will employ 225 men.

Castalia Portland Cement Co., Castalia, Ohio, reports that the present year thus far has been the best in the history of the company. In July the plant put out more than 117,000 bbl. of cement and one day in August shipped 7000 bbl. September promises to be a bigger month than either July or August, according to the company's officials.

Gypsum

Certain-Teed Products Corp.'s plaster mill south of Laramie Wyo., suffered a loss which is approximated at $400 when a newly constructed wooden dust collector on the second floor of the plant became overheated and caught fire. The plant was saved from further damage by an automatic fire extinguisher sprinkling system which set off the fire alarm.

Gypsum, Lime and Alabastine, Ltd., Paris, Ont., Canada, which purchased the Crystalite Stone Products, Ltd., Hamilton, Ont., early this year, is now operating this plant as a division of the company under the name of Crystalite Products, Ltd. They are using the Hamilton factory as a stucco plant and warehouse for the convenience of local dealers. At the present time Crystalite stucco is being made in Toronto, Hamilton and Winnipeg and will later be manufactured in Montreal and distributed there through the company's Quebec sales force. H. S. Johns, former manager of Crystalite Stone Products, Ltd., is manager of the Hamilton plant, and in Ontario these products are distributed under the direction of W. J. McCann, Ontario sales manager.

Agricultural Limestone

Laughlin, Mendocino County, Calif. Tests made of the first agricultural limestone crushed by the new plant at Laughlin show it to be high in mineral content and of fine quality. The limestone will be used on the soils of the Redwood Empire region. The project was sponsored by the Northwestern Pacific Railroad Co. in an effort to aid farmers of this region in improving their crops.

Cement Products

Sibley, Ia. New equipment to make culvert pipe that will pass the most rigid tests of the State Highway Commission is being installed at the local cement tile works. The plant manufactures well pots, tile, silo staves and miscellaneous other cement products. According to Fred Reeves, the company is now endeavoring to produce a cement product that is nonporous.

Silica Sand

Silica Co. of California, San Francisco, Calif., has expended $60,000 in erecting a plant on a 10-acre site located approximately three miles from Byron, Calif. The company is mining five carloads of silica sand daily and later the output will be increased to ten or more cars per day. The product is furnished the Illinois-Pacific Glass Co. of San Francisco and other concerns for glass making, and molding sand is supplied to practically all the leading foundries on the Coast. Marvin Greathouse is president of the company.

Personals

John J. Cone, president of Robert W. Hunt Co., Engineers, Chicago, and a member of that company since its organization in 1888, has retired. **C. B. Nolte**, vice-president and general manager, has been elected president and general manager of the company, with headquarters at the general office in Chicago. **J. C. Ogden**, a director and eastern manager of the company, has been elected vice-president, with headquarters in New York City.

J. H. Horlick, Jr., has been appointed assistant director of sales of the explosives department, Hercules Powder Co., Wilmington, Del. Mr. Horlick served for a number of years as manager of the service division, explosives department, and in his new capacity he will take over the duties of the late Fred F. Smith. **J. Barab** will be the new service division manager and **H. M. Lynch** will continue to act as chief clerk and as assistant to Mr. Horlick.